Congratulations
The Chicago & North Western Ry.
on Their 100th Anniversary

On October 25, 1848, The Chicago & North Western Railway introduced railroad transportation to Chicago and the west with a 10 Ton locomotive appropriately named "THE PIONEER".

Today—from the World's great railroad center, their modern trains—CITY OF SAN FRANCISCO, CITY OF LOS ANGELES and "THE 400's" offer deluxe and fast transportation to many points.

The P. & M. Co. extend their congratulations and are proud to share in some degree in this achievement by furnishing a device which has assisted them in maintaining their track structure at high standards for safe and speedy travel.

THE P. & M. CO.

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Here's where TRACK has to "TAKE IT"

"Edgemark of Quality"

The banging of cars being coupled, the sudden starting and stopping of shifters and long freights, put a heavy strain on track fastenings. But yard tracks can "take it" when joint bolts have Reliance Hy-Pressure Hy-Crome Spring Washers to help maintain their tightness.

Informed maintenance men have proved, in the yards as well as on main line track, Reliance Hy-Pressure Hy-Crome Spring Washers play an important part in cutting maintenance costs and keeping track joint bolts *tighter longer.*

Made from special-analysis steel, providing maximum spring power and fatigue resistance, Reliance Hy-Pressure Hy Crome Spring Washers possess reactive value which automatically compensates for looseness resulting from wear.

An interesting illustrated folder of Reliance Hy-Crome Spring Washers for track-work offers pertinent pointers on maintenance-of-way economy. Write for a copy.

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EATON MANUFACTURING COMPANY

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Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

An effective method

to preserve the safety factor

in your bridges

● Loss of metal that saps structural strength of bridges can be stopped promptly by application of NO-OX-ID.

Special consistencies of NO-OX-ID rust preventive have been formulated for bridge protection. They prevent metal loss two ways:

1. *Mechanically* . . . by forming a protective film that excludes moisture and oxygen from exposed iron and steel surfaces.

2. *Chemically* . . . by utilizing inhibitors which prevent under-film corrosion.

Applications can be made over adhering rust, without *expensive, extensive* precleaning.

Ask about the NO-OX-ID protective program for bridges, turntables, conduit, pipe, tanks, signal bridges, and expansion bearings. It is available for the asking.

Vulnerable areas completely protected

NO-OX-ID IRON OXIDE RUST
REG. TRADEMARK AUG. 27, 1918

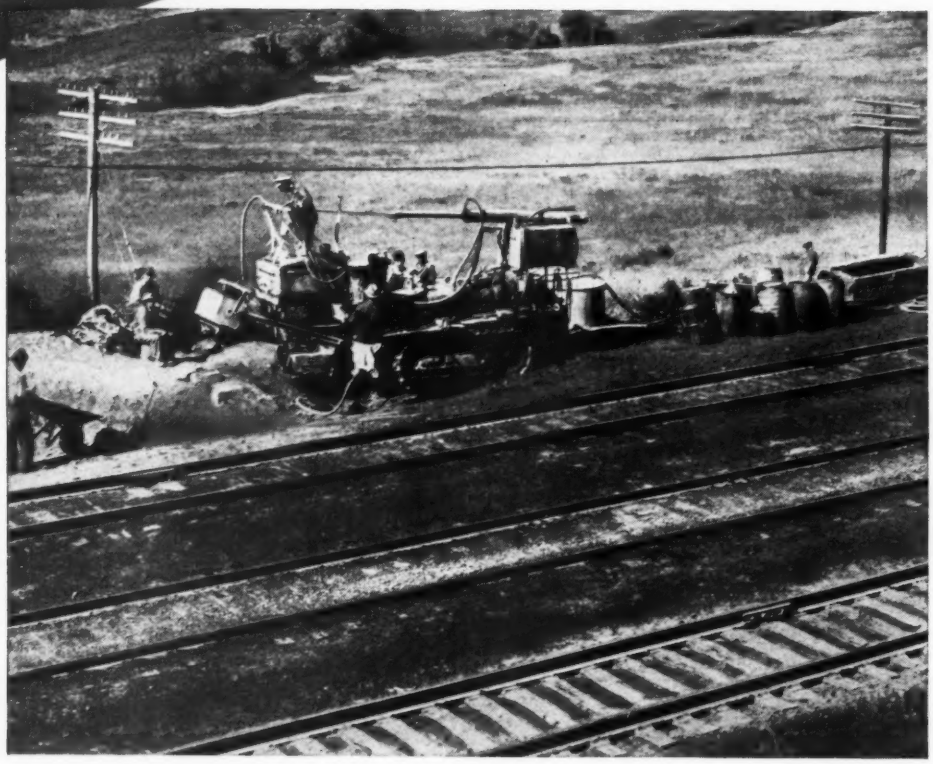
THE *Original* RUST PREVENTIVE

Dearborn Chemical Company
Dept. U, 310 S. Michigan Ave., Chicago 4, Ill.
New York • Los Angeles • Toronto

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00 for one year; $3.00 for two years. Single copies 50 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., post office. Address communications to 105 W. Adams St., Chicago 3, Ill.

USE THIS SIMPLE SET-UP

FOR BETTER ROADBED STABILIZATION AT LOWER COST

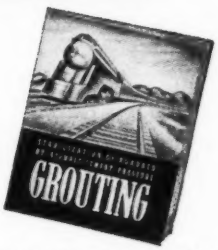


MODERN asphalt-cement pressure grouting has proved the most effective and least expensive method of stabilizing roadbed. When *Texaco No. 24 Emulsified Asphalt* is used, results are definitely superior and more enduring.

Texaco No. 24 Emulsified Asphalt was developed especially for grouting. It does a far better job than ordinary emulsified asphalt in promoting freer flow, more thorough penetration and better seal. It helps waterproof the soil, keep it stable, yet resilient, and permits the use of leaner, more economical mixtures.

Grout prepared with *Texaco No. 24 Emulsified Asphalt,* is easy to apply and gives lastingly effective results. Its low first cost is more than repaid by the impressive savings in maintenance it makes possible.

Get the full story. Call the nearest Railway Sales Division office listed below, or write The Texas Company, *Railway Sales Division,* 135 East 42nd Street, New York 17, New York.



SEND FOR this fact-packed, 16-page, illustrated book. Describes the development of asphalt-cement pressure grouting, outlines a practical working set-up, shows costs, tells benefits secured by a leading railroad.

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TEXACO Emulsified Asphalt

FOR GROUTING

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- **Simplicity of design**
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  —easy operation without complications. No fear of shutdown on the line because of control failure.
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- **Ball or Roller Bearings on all high speed shafts**
  —minimum loss of power to friction.
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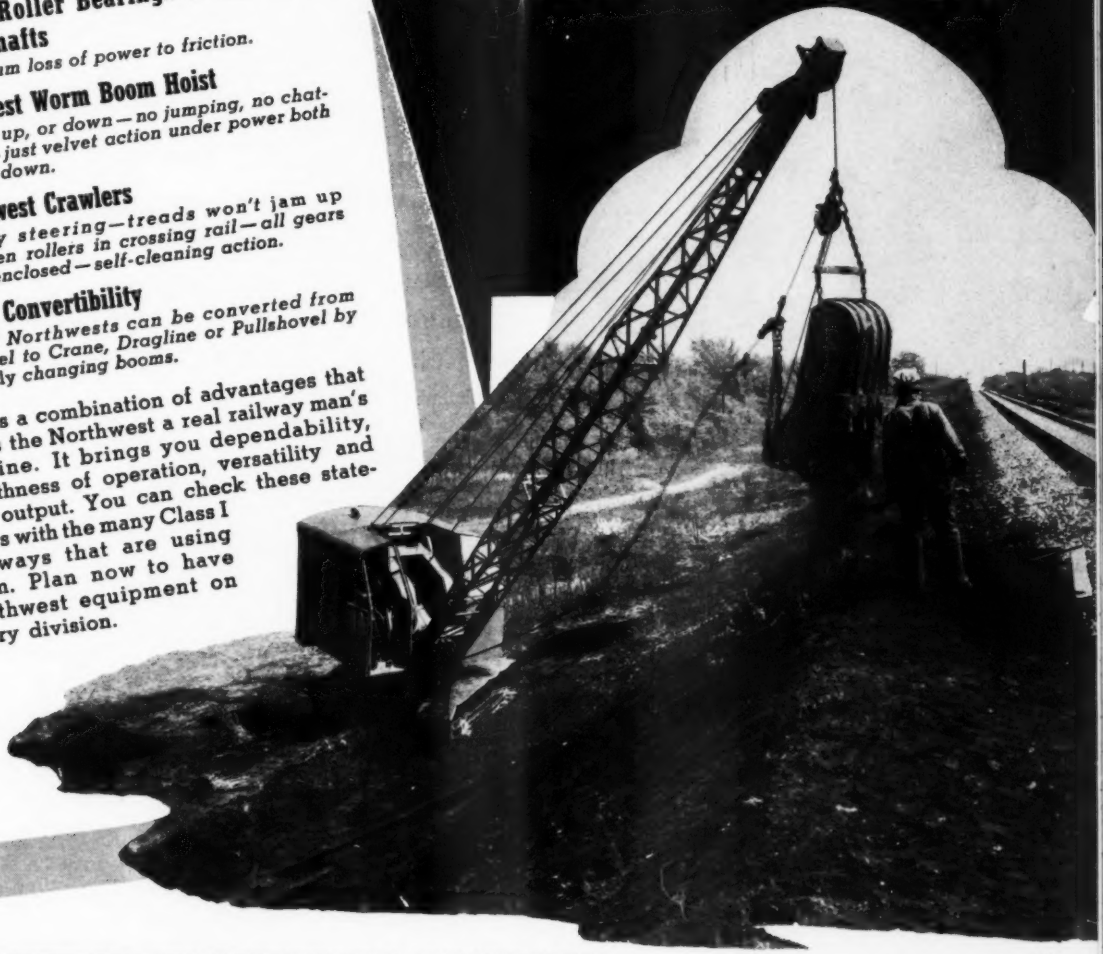
  —all Northwests can be converted from Shovel to Crane, Dragline or Pullshovel by simply changing booms.

Here is a combination of advantages that makes the Northwest a real railway man's machine. It brings you dependability, smoothness of operation, versatility and high output. You can check these statements with the many Class I Railways that are using them. Plan now to have Northwest equipment on every division.



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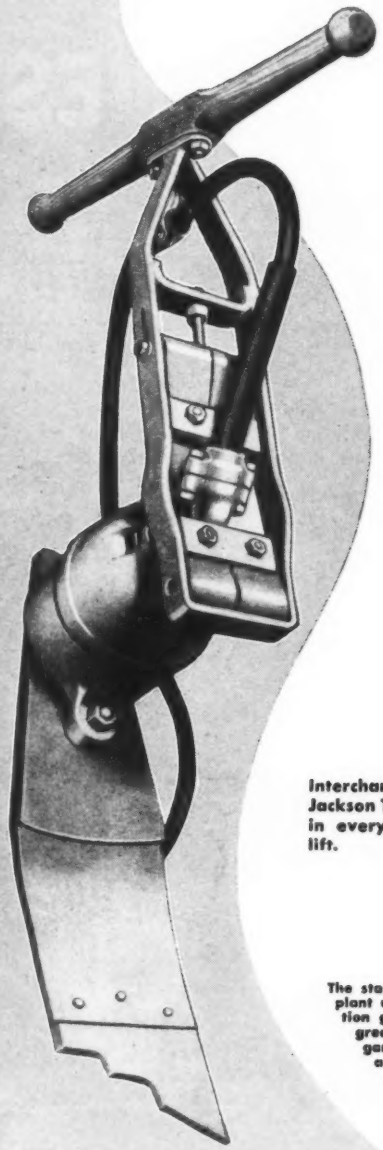
Proved on the Nation's Leading Railways

For the "ALL OVER" Job
of low cost track maintenance

JACKSON *Tampers* AND POWER UNITS



Ask the men who really know what it takes to economically maintain track capable of sustaining the over-grown freights and streaking streamliners — the maintenance-of-way chiefs of the leading lines. The overwhelming majority will tell you that for the over-all job of both spot tamping and general surfacing, there's nothing that compares favorably with JACKSON Vibratory Tampers & Power Plants. They'll tell you that the roadbed produced with JACKSON Tampers is more firmly compacted, longer-lasting; that labor costs are lower because JACKSONS are faster; and that with just ordinary care, this equipment is always on the job and ready to go.

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Interchangeable blades make Jackson Tampers top performers in every ballast and in every lift.

The standard Jackson 4-tamper plant used by the normal section gang can be grouped to great advantage in extra gang service when desired, and returned to the sections when the job is done.

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ACCO Registered WIRE ROPE SLINGS HELP CLEAR THE TRACKS—*FAST*

Lifting jobs in all industries are being handled with equal satisfaction.

WILKES-BARRE, PA.—With maintenance of schedules of paramount importance, railroad supervisors and workers find that Acco Registered Wire Rope Slings, with their neat, compact Acco-Loc Safety Splices, get derailed equipment back on the tracks with minimum effort . . . plus a guaranteed safety factor.

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Acco Registered Wire Rope Slings are made of improved plow steel wires which are preformed to remove the fight found in "home-made" and many other wire rope slings. They are factory proof-tested at double their rated loads. These tests are made after the fittings are attached so the complete unit is safe for you to use.

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You have a complete choice of constructions: Strand-Laid, Cable-Laid, and 6 and 8-part Braided. Each construction has advantages which make it best for a specific job. Get all the facts on Acco Registered Wire Rope Slings from your distributor today... or write the nearest Acco district office shown below.

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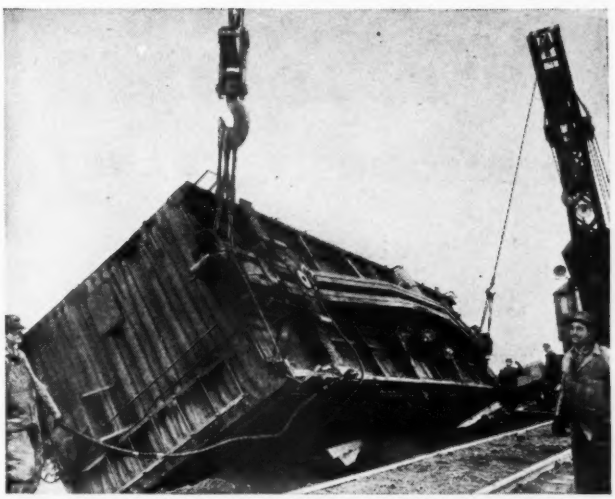
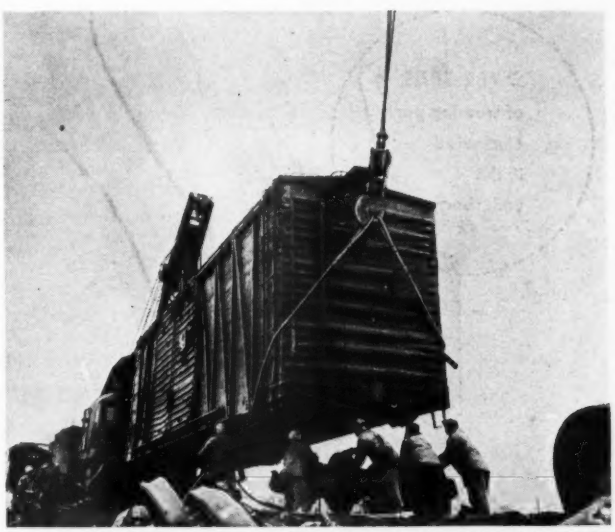


Two 8-part Braided ACCO Registered Wire Rope Slings are ideal for pulling cars out of ditch. They are flexible, easy to attach, and provide great strength.



For routine lifts tough, durable, all-steel Strand-Laid ACCO Registered Wire Rope Slings offer the greatest strength at the lowest cost.

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SAVES 25¢ TO 50¢
OF EVERY UPKEEP DOLLAR!

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SEVEN TONS of wearing parts eliminated in the underbody

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For additional information, use postcard, pages 35-36

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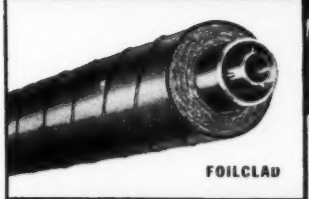
Custom-Built TO PROJECT SPECIFICATIONS



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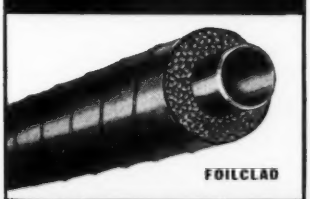
INSULATED, JACKETED PIPE

Pipe supported within a pipe, either to carry heating or cooling medium, other for process fluids.



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REFRIGERANT LINES

Low temperature cork insulation, coated with asphalt and tension-wrapped with foil covering.

HEL-COR

UNILINE CONSTRUCTION

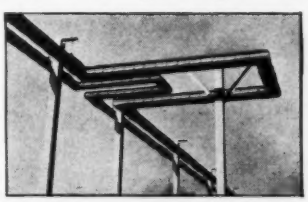
Helically corrugated iron housing, pipes nested inside insulation liner to maintain required temperature.

FACTORY PRE-FABRICATED INSULATED PIPING FOR STEAM AND VISCOUS FLUIDS

● Every construction engineer knows the loss of time, the hazards and the cost of sundry materials needed for insulating, waterproofing, wrapping and wiring of overhead pipe lines, when these operations have to be done on scaffolding. The Ric-wiL Unit method of installation eliminates most of this costly field work, makes possible phenomenal speed on the job and assures a permanent trouble-free system. Prefabricated 21-foot sections are delivered to job site, complete with pipe, insulation, couplings and accessories, and ready for hoisting onto trusses. Several units may be coupled on the ground before installation, minimizing overhead work under difficult conditions. On one job, 1500 feet of Ric-wiL Units were installed in place on channel steel uprights—with pipe welded and ready for couplers and insulation between units—*in only two working days.*

In Ric-wiL Foilclad Units, insulation is machine-coated with high temperature asphalt, then tension-wrapped with asbestos felt. This is followed by second coating of asphalt and finally covered with spiral tension-wrapping of foil, forming perfect bond with asphalt coating. In Ric-wiL Hel-coR Insulated Pipe Units, pipes and insulation are housed in 16 gauge helically corrugated galvanized iron housing.

Ric-wiL's full line of factory prefabricated accessories includes expansion devices, anchors, fittings, drip legs, valve connections and all other accessories required for fast, economical field installation.



Typical installation showing double overhead expansion loop for steam and return line.

For further information on Ric-wiL Insulated Piping write The Ric-wiL Co., Dept. 1381.

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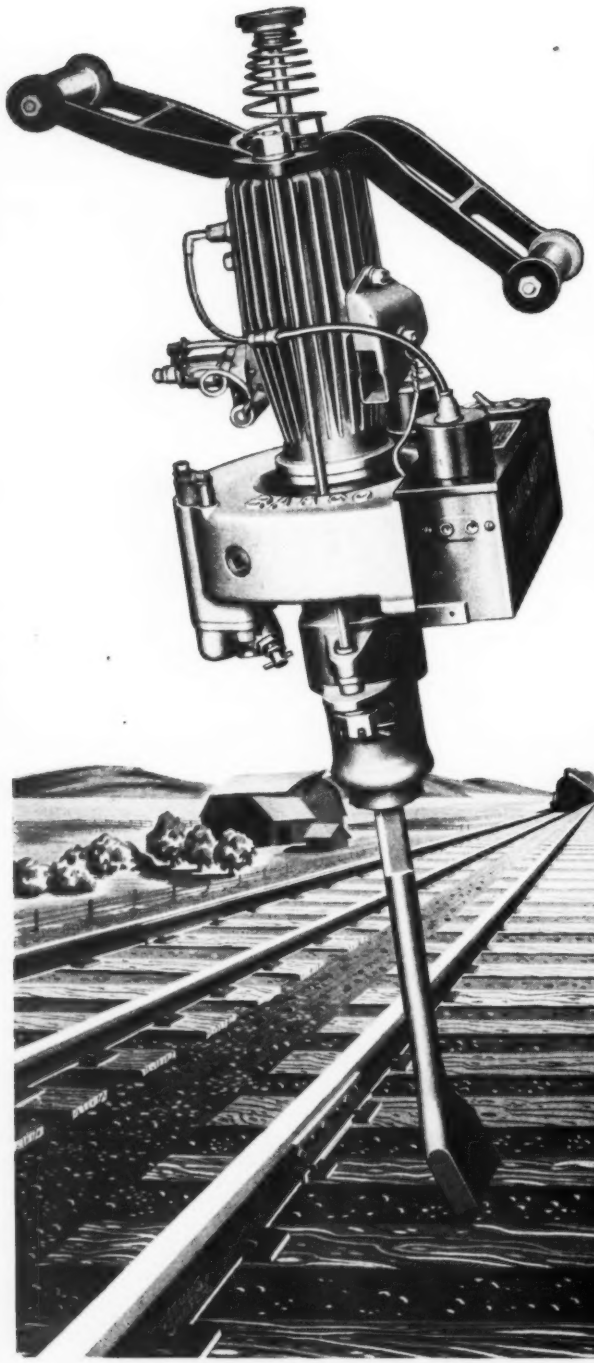
INSULATED PIPE CONDUIT SYSTEMS

THE RIC-WIL COMPANY • CLEVELAND, OHIO

CABLE ADDRESS: RICWIL, BENTLEY'S CODE

TIME HAS PROVED THE VALUE OF BARCO



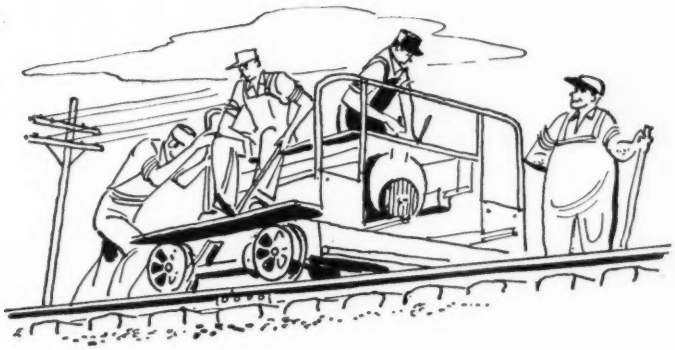
TIME—not just a few years, but a whole decade—has proved in actual service that Barco does more uniform and longer-lasting tamping, at lower cost. Simple and rugged—well balanced—weight adjusted for maximum service with least effort. No other tytamper will do the same work in the same time with the same number of men.

For spot or gang tamping, cribbing, breaking, drilling and winter ice service—put Barco Unit Tytampers on the job. For full information write to Barco Manufacturing Company, Not Inc., 1805 Winnemac Avenue, Chicago 40, Illinois.

BARCO

UNIT TYTAMPERS

Free Enterprise—the Cornerstone of American Prosperity



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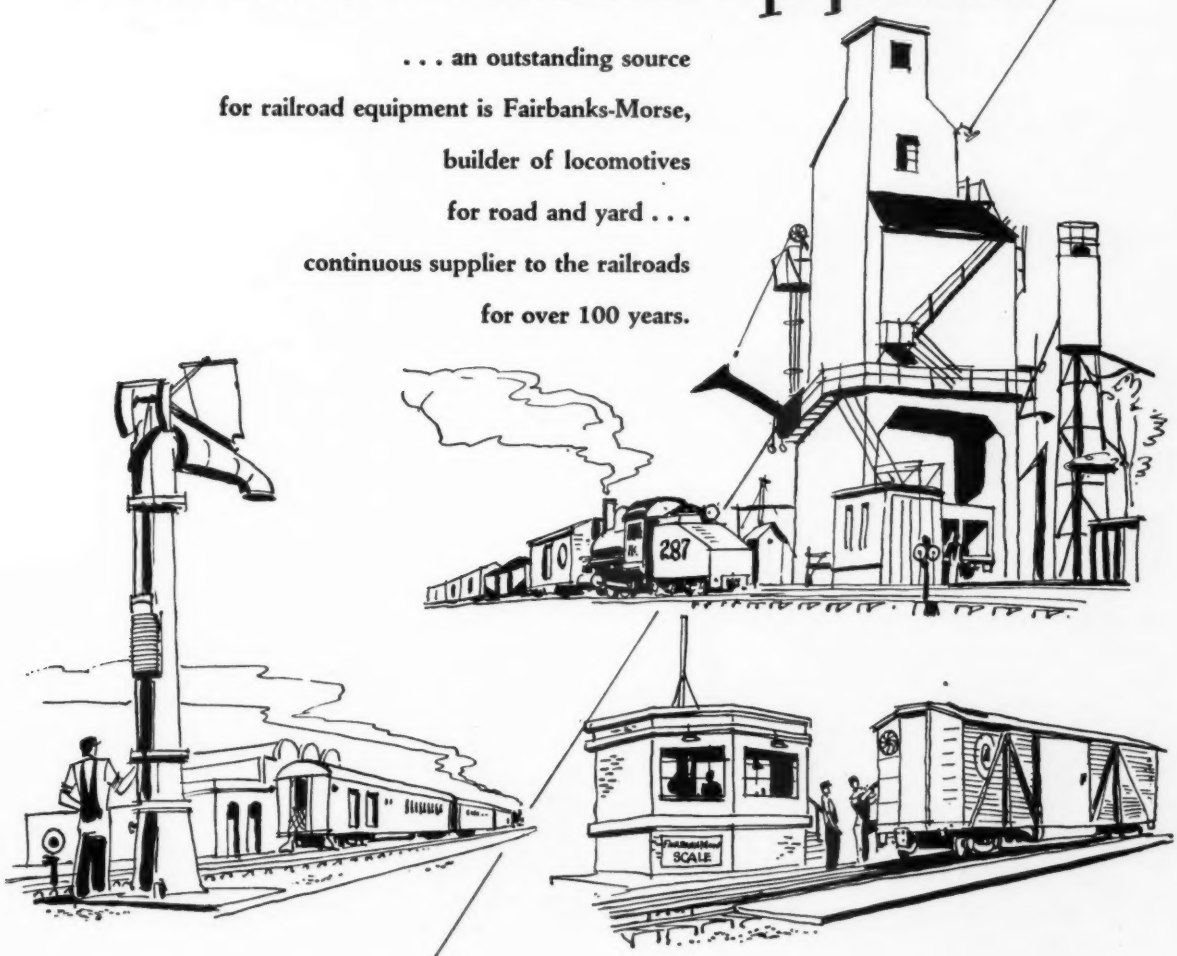
builder of locomotives
for road and yard . . .
continuous supplier to the railroads
for over 100 years.



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The NEW APPROACH to R. R. WEED CONTROL

General Chemical's *PO-CAP* WEED KILLER*

New tested all-purpose organic chemical combination

RAILROADS HAVE LONG been limited to the use of temporary measures for eradication of weeds and noxious grasses on their tracks. Control has been no better than the materials available—"stop gap" at best—without lasting results.

NOW, General Chemical Research provides the modern scientific approach to this problem in the truly new, all-purpose organic chemical combination—*PO-CAP Weed Killer.*

THIS UNIQUE COMBINATION has been carefully developed step by step through intensive experimentation and field investigations to perform specific functions. Extremely toxic, yet stable organic chemicals have been formulated to fill all the requirements necessary for *complete* control of railway weeds.

WHEREVER USED, this revolutionary combination has already established control records unmatched by old-type inorganic chemicals.

IF YOU ARE LOOKING forward to the time when ballast and soil sterilization will replace temporary annual weed killing on your railroad, investigate General Chemical's PO-CAP Weed Killer now before the season starts. This way your requirements can be studied thoroughly to develop an individualized weed and grass control program of maximum efficiency for each track area involved. *Remember: in using General Chemical's PO-CAP Weed Killer your goal can be more permanent sterilization—not just temporary seasonal relief!*

★General Chemical Trade Mark

"COMPLETE" CONTROL OF RAILWAY WEEDS MUST

Kill Grasses	**Suppress Seed Germination**
Kill Broad Leaved Weeds	**Suppress Regrowth**
Kill Woody Vines & Creepers	**Resist Washing Away by Rainfall**
Kill Woody Shrubs	**Preserve Track Structures**

GENERAL CHEMICAL* PO-CAP WEED KILLER *MEETS THE REQUIREMENTS!

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Weed Killer Department

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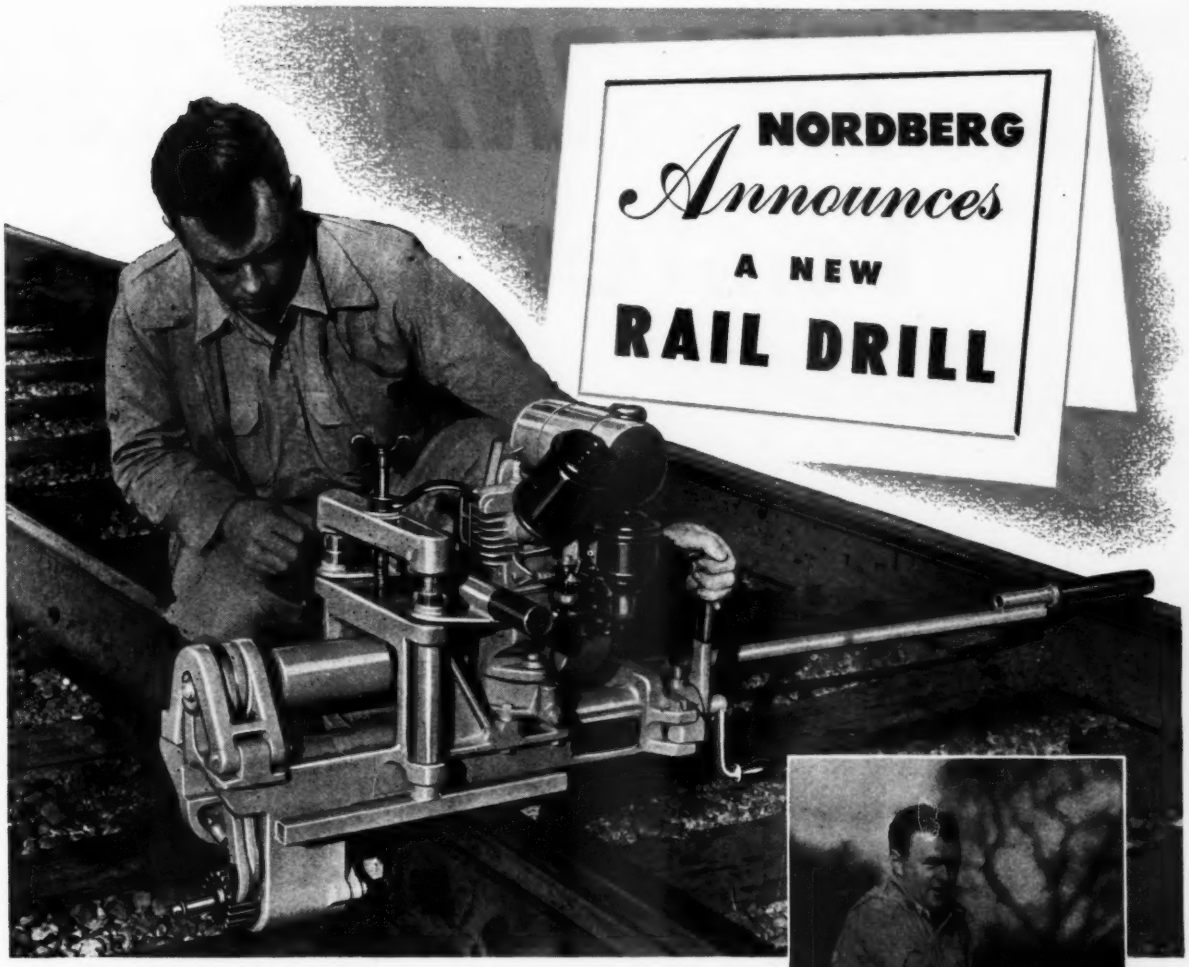
For additional information, use postcard, pages 35-36



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Weight has been reduced to 132 pounds by use of aluminum frame and other design features. Easily carried by one man.

LOW PRICE

The unusually low price of the CD Drill permits one being located at all points where rail is occasionally drilled.

HEAVY DUTY PERFORMANCE

Although light in weight and low in price, the CD Drill will do all that was done by previous heavy duty models, and in addition, has features the earlier machines did not have.

The new Model CD Rail Drill is the latest of the many contributions that Nordberg has made in the development of unusual machinery for the maintenance of track. For more than twenty years, Nordberg has been the nation's foremost builder of this type of equipment and its achievements have made posssible to do with machinery many maintenance operations that were formerly done by hand — do them better, faster and at less expense. You need more and better rail drills. Investigate the merits of this latest Nordberg time and money saving contribution.

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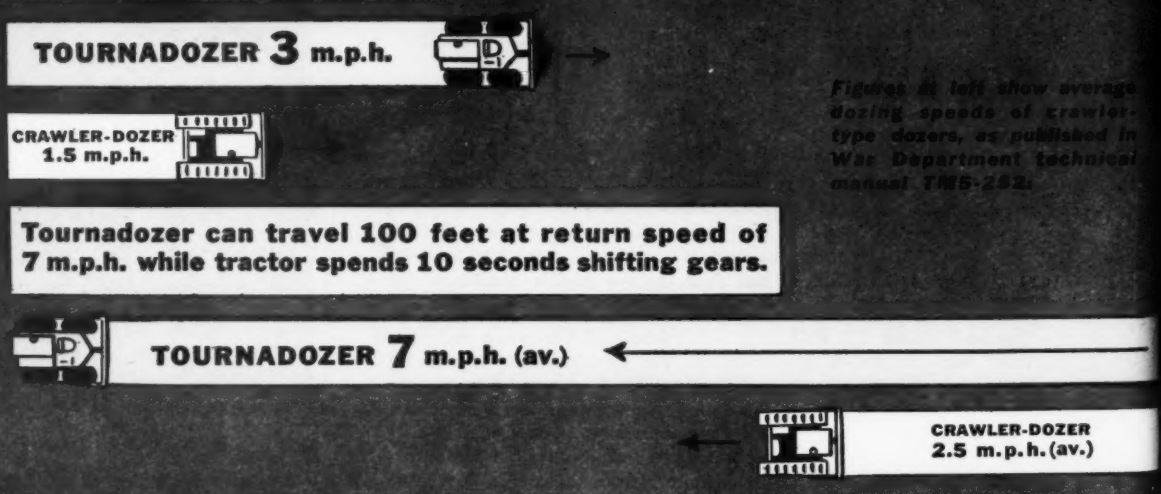
Faster Dozing

Compare cycle time ... figure production

TOURNADOZER gives you double the average dozing speed forward . . . three times more speed in reverse. In addition, instantaneous speed selection saves up to 10 seconds every time you shift gears. Big rubber tires and 15 m.p.h. top speed get Tournadozer anywhere on your job in a hurry. Fast, self-powered job-to-job moves over pavement, yards and tracks, or along right-of-way reduce your non-productive move time. Tournadozer enables you to get more work done at lowest net cost. Mail coupon at right for complete facts. DO IT NOW!

Increased speed plus instantaneous


TOURNADOZER 3 m.p.h.
CRAWLER-DOZER 1.5 m.p.h.
Tournadozer can travel 100 feet at return speed of 7 m.p.h. while tractor spends 10 seconds shifting gears.
TOURNADOZER 7 m.p.h. (av.)
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Figures at left show average dozing speeds of crawler-type dozers, as published in War Department technical manual TM5-252.

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TOURNADOZER-TRADEMARK R127-RR

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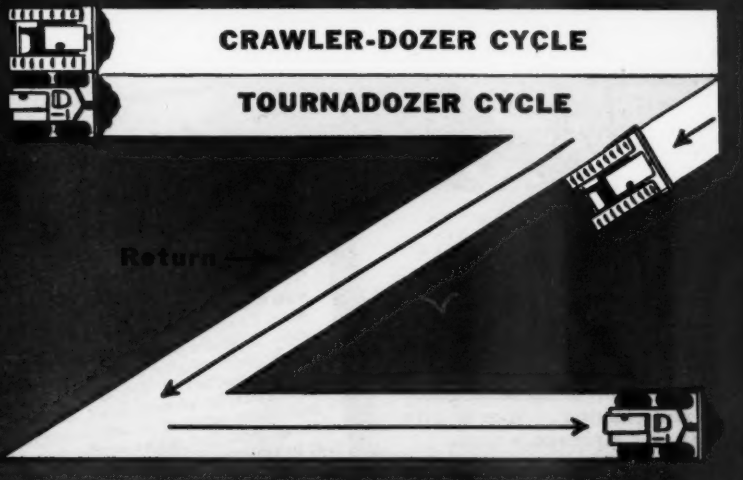

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One Man ELECTRIC CHAIN SAW

FOR BRIDGE BUILDING AND CONSTRUCTION

The Saw That Will Cut Your Costs

This is it... an amazingly light yet rugged, powerful and efficient chain saw that will save time and cut costs everytime it is used... a *one man* High Cycle Electric Driven Saw that will cut a 12 x 12 timber in 9 seconds flat, and has a capacity up to 3'.

With a Carryable Homelite High-Cycle Gasoline-Engine-Driven Generator as its power supply, you can use this 27 lb. chain saw *anywhere.* You can cut piling or heavy timber not only fast but right where construction and repairs are being done. Simple to operate, this saw makes cutting ... on all cuts, all positions... much easier. Its unique pivot action takes the strain off the operator. And there are no fumes or engine heat and vibration to cause fatigue. It is simple in design, sturdy in construction... sure to give you greater dependability and lower maintenance costs.

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Get an Extra Bonus with Homelite Carryable Power

Don't forget this *most important point.* The Homelite Carryable Generator that you use to operate your Homelite One-Man Chain Saw is an *All-Purpose* Generator. You can use it to operate high-cycle tools such as grinders, nut runners, impact wrenches. You can use it for 110-volt circular power saws, electric drills and many other standard universal power tools. And for night work, you can use it to operate several brilliant floodlights.

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2011 Riverdale Ave., PORT CHESTER, NEW YORK

For additional information, use postcard, pages 35-36

less

platform cost

"per foot"

with **KOPPERS PRESSURE-TREATED WOOD**

Platforms built of Koppers Pressure-treated wood prove their economy by lasting longer . . . costing less for repairs and maintenance.

Whether it has to stand the hurrying feet of thousands of passengers, or the grinding wear of freight handling, a platform takes a terrific beating. Any fiber of wood that is weakened by *decay* can't resist *wear.* That is an important—and often unrecognized—reason why platforms "wear out" so rapidly, and require early and expensive repairs. Actually, they are not "wearing out," but *rotting out.*

Koppers Pressure-treated wood is enduringly protected against decay. The original strength of the lumber is maintained, and the useful life of the platform is decisively extended. Longer life before replacement and lower maintenance expense make important savings in platform cost per passenger, or per ton of freight handled.

If you are interested in more information about reducing your maintenance costs through the use of Koppers Pressure-treated lumber, just write.

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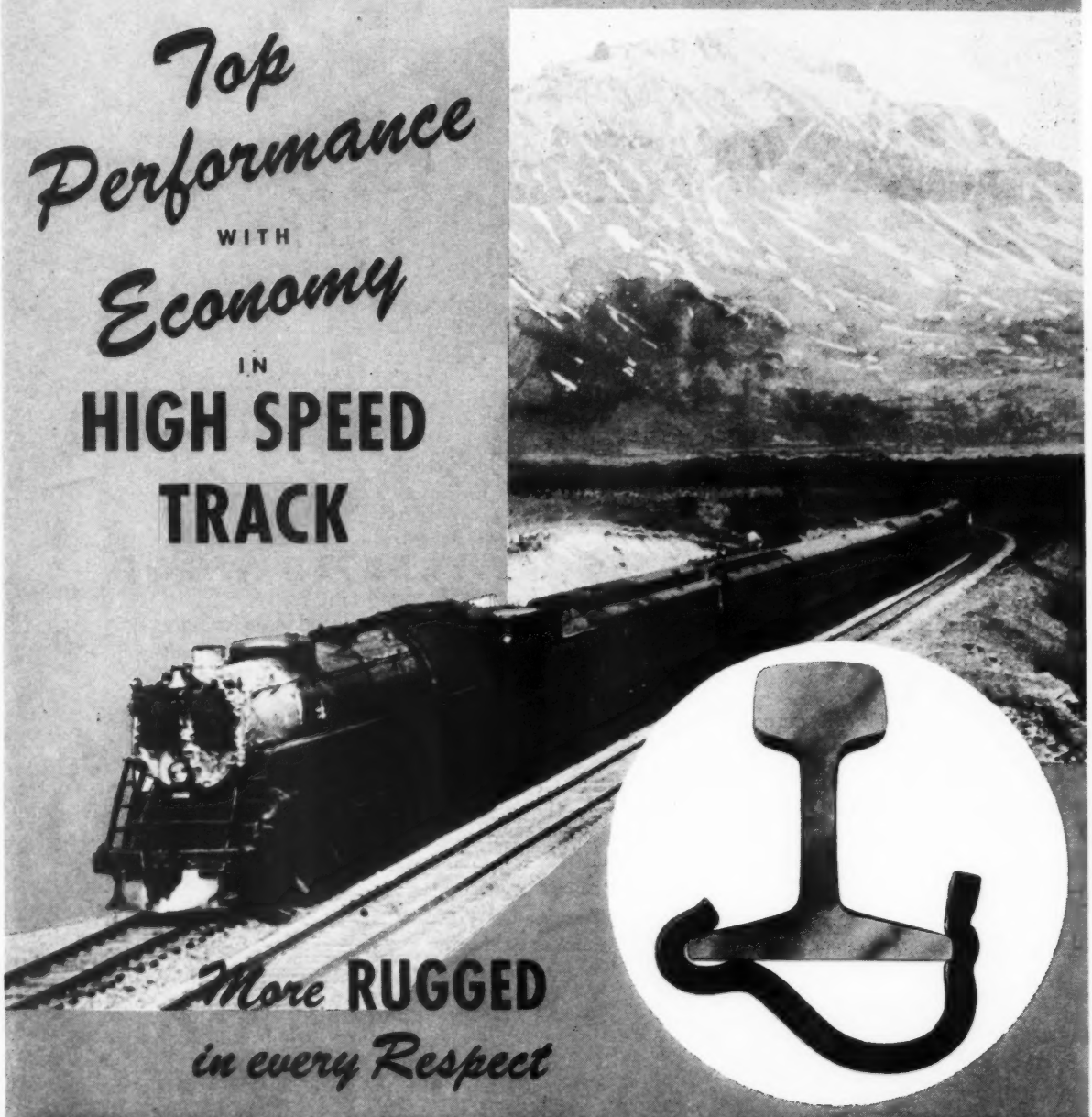
KOPPERS COMPANY, INC.

Pittsburgh 19, Pennsylvania

The Improved UNIT RAIL ANCHOR

SINGLE OR DOUBLE NOTCH

Top Performance WITH Economy IN HIGH SPEED TRACK



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Sure they're **WELDING** open track

Look at these SAVINGS

In a mile of OXWELD pressure-welded rail in open track, over 270 joints and signal bonds are missing. With their disappearance, these maintenance operations disappeared also:

- Tightening 1080 joint bolts
- Heat treating 540 rail ends
- Picking up 270 rail joints frequently
- Rebuilding or replacing 540 joint bars
- Replacing 540 joint ties
- Repairing and replacing many signal bonds
- Replacing rail because of end batter

These maintenance savings in a mile of track made of continuous rail will give you some idea of the savings possible on your railroad.

Chief Engineers and other Maintenance-of-Way men... write for booklet F-6806 which describes the installation and use of OXWELD continuous rail in open track.

The word "Oxweld" is a registered trade-mark.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building Chicago and New York
In Canada:
Canadian Railroad Service Company, Limited, Toronto

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

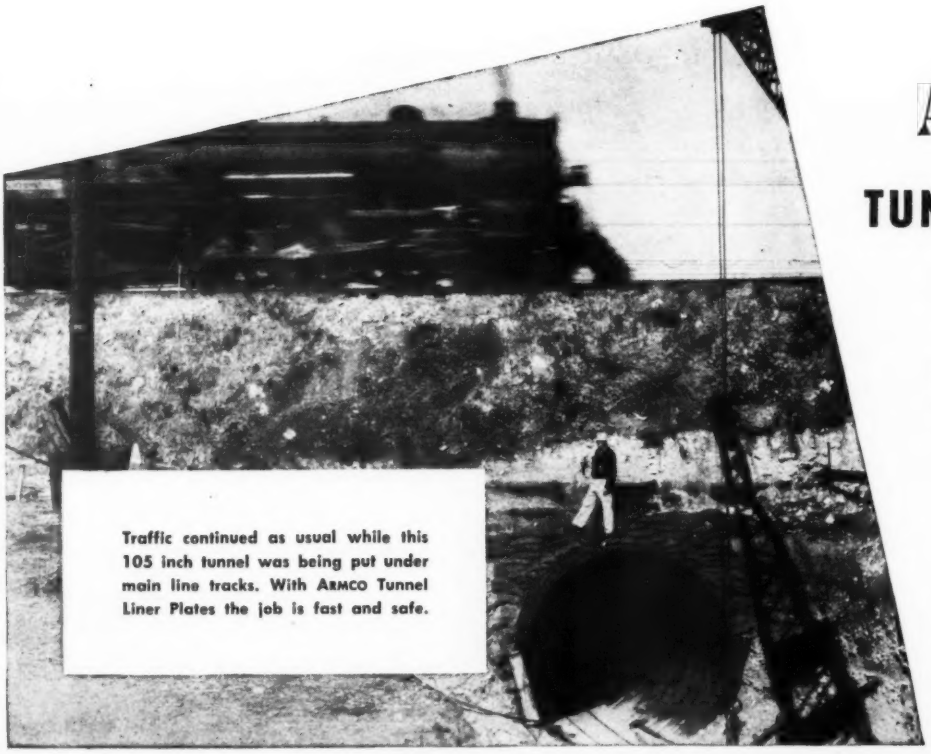
hole through . . . ahead of schedule

Have you heard about ARMCO Tunnel Liner Plates for faster, more economical tunneling? Here's the simplest, most inexpensive way you ever saw to line new tunnels or reline old ones.

These sturdy, corrugated liner plates are designed to assure safe strength without excessive bulk or weight. One man can easily handle the light-weight steel sections, bolting them together with ordinary wrenches. The job moves fast.

With ARMCO Liner Plates you gain added safety, fire-protection, and utmost economy. No paying "hidden costs" in excess weight. And ARMCO Tunnel Liner Plates are nestable to conserve hauling and storage space.

Consider ARMCO Liner Plates for that next tunneling job. The chances are you'll "hole through" ahead of schedule and under the estimate. Diameters range from 45¼" to 33 feet. Write for complete data. Armco Drainage & Metal Products, Inc., 1275 Curtis Street, Middletown, Ohio.



Traffic continued as usual while this 105 inch tunnel was being put under main line tracks. With ARMCO Tunnel Liner Plates the job is fast and safe.

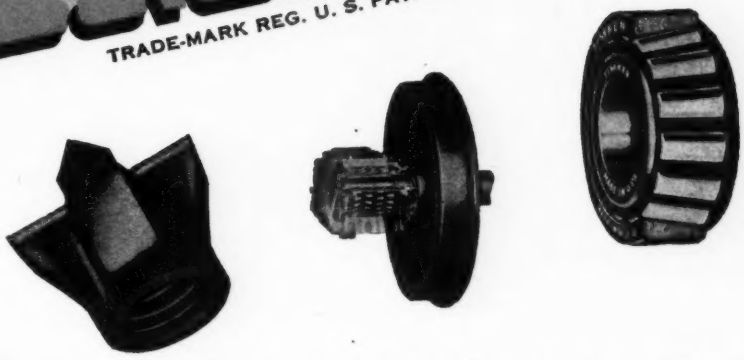
ARMCO

TUNNEL LINER PLATES

ARMCO

TIMKEN

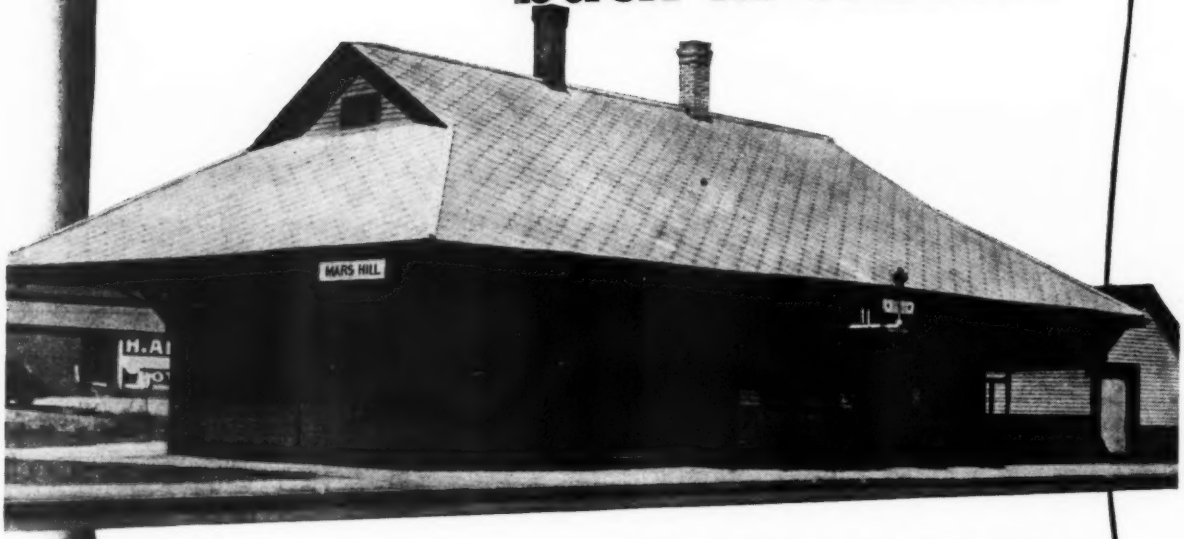
TRADE-MARK REG. U. S. PAT. OFF.



Means "Made By The Timken Roller Bearing Company." It identifies the source of Timken Tapered Roller Bearings, Timken Railroad Roller Bearings, Timken Alloy Steel, Timken Seamless Steel Tubing and Timken Rock Bits. This trade-mark is your assurance of getting genuine Timken products. Look for it when buying.

THE TIMKEN ROLLER BEARING COMPANY
CANTON 6, OHIO

They began specifying J-M ASBESTOS SHINGLES back in 1921...



and this roof on the Mars Hill station of the Bangor and Aroostook has withstood Maine's extremes of cold and heat for a quarter of a century!

BACK IN 1921, this attractive and durable roof of J-M Asbestos Shingles became the first of numerous long-lasting installations that have since been specified for all major buildings of this progressive Maine line.

Today... after more than 25 years' exposure to sun, wind and rain... its protection is as complete as the day it was put on over an old cedar shingle roof!

Cases like this – one of many "old-timers" among J-M Asbestos Shingle roofs in railroad service – are the best proof that these shingles are built to last. Both fireproof and rotproof, *not one* has ever burned or worn out. And maintenance in most cases has been next to nothing!

You'll be pleased to learn how little it will cost to get this same long-lasting, low-cost protection for buildings along your right of way. Get full information by writing Johns-Manville at New York, Chicago, Cleveland, St. Louis or San Francisco.

Johns-Manville

89 YEARS OF SERVICE TO TRANSPORTATION

✓ EASY ON THE OPERATOR

✓ EASY TO HANDLE AND SPOT

✓ SAFE AND DEPENDABLE

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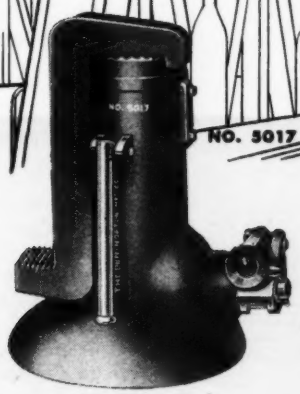
ARE BEST FOR

Bridge Construction and Maintenance



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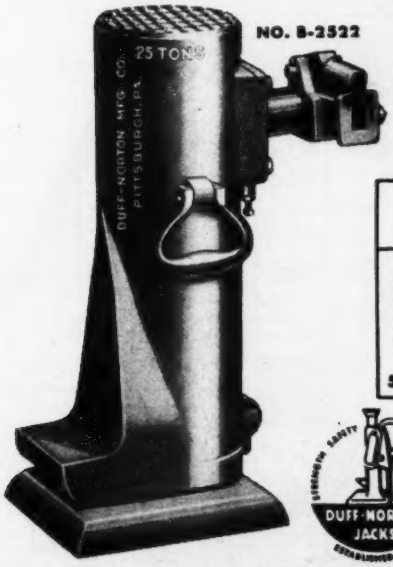

NO. B-2522

Built for rough outdoor service, Duff-Norton Jacks require a minimum of effort in lifting or lowering heavy beams, rigging, heavy machinery and equipment used on bridge construction and maintenance jobs—due to leverage, ball bearing action and accurately machined parts.

JACK ADJUSTMENT CONTROLLED TO WITHIN A FRACTION OF AN INCH

Heavy loads are supported for long periods of time without danger of creeping or settling—with precision adjustment control. Write today for descriptive catalog.

There's a Duff-Norton Jack for every need.

QUICK REFERENCE GUIDE FOR BRIDGE JACKS YOU NEED

Jack No.	Capacity Tons	Height Inches	Raise Inches	Base Inches	Head Diam. Inches	Foot Lift Ht. Inches	Weight Pounds
915	15	14¾	9	6 x 7½	3⅛	—	42
B-1522	15	22	10	7½ x 9¾	4¾	3⅛	112
B-2522	25	22	10¼	8 x 9¾	5¾	3¾	142
B-3526	35	26	14	9 x 10½	6¾	3¾	208
B-5024	50	24	10⅝	14 diam.	10¼	5¼	270
5017	50	16½	7	14	5½	5	195
5010-C-2	50	10	4½	7⅛	4	—	64

THE DUFF-NORTON MANUFACTURING CO.

The House that Jacks Built • **PITTSBURGH 30, PA.**

THE WORLD'S OLDEST AND LARGEST MANUFACTURER OF LIFTING JACKS

...And Still Chicago Grows

WITH PERMANENT, SAFE CLAY PIPE INSTALLATIONS

EVER since Mrs. O'Leary's cow kicked up the big fuss back in 1871, Chicago has been *growing*. From a population of less than 300,000 on the date of that terrible disaster, the famous Windy City has marched along to a hefty 3,500,000. The railroads have stimulated this growth, year by year, making Chicago the hub center of a giant network of tracks. Today Chicago's mother-state has 11,760 miles of track — running second only to gargantuan Texas.

Vitrified Clay Pipe has played an important role in this expansion. For engineers know that Vitrified Clay Pipe is the only sewerage and drainage pipe impervious to the action of corrosive materials, acids and ground alkalies. *In all the history of Chicago railroading there has never been a single instance where Clay Pipe has worn out!* If you need specific information on Clay Pipe, write the details to the office nearest you.

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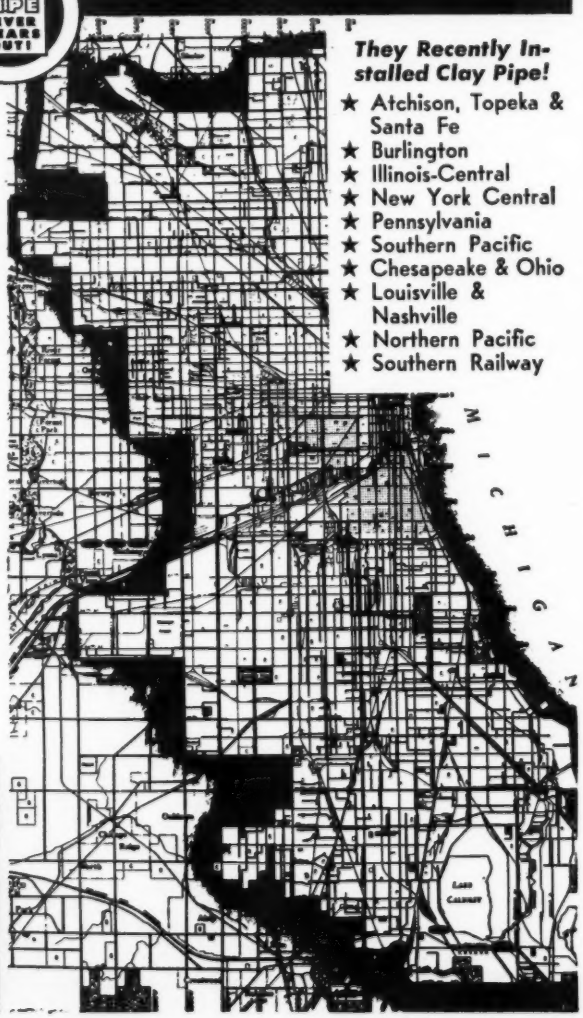

LE ROI announces The New No. 11 Backfill Tamper

. . . built by rock-drill men to rigid rock-drill tolerances—gives you longer life, easier holding, faster tamping

HERE, for the first time in rock-drill history, you have a tamper that is *really* built to take it. That is why Le Roi No. 11's outperform — outlast any other make. Look at these features:

Tough, protective armor — high-strength drop forgings are used for the backhead, cylinder, piston, and throttle lever.

Engineered impact blow — just the right kind of wallop — it properly compacts the fill, and it makes possible the easy handling that further speeds tamping.

Smooth, frictionless action — new metal-foil packing prevents piston stem from scuffing — increasing its life.

Sealed from grit and dirt — Le Roi wiper construction in front-bumper retainer keeps harmful foreign matter out of the machine.

Trouble-free valve — extremely low air consumption and long-life efficiency result from using the new Le Roi valve design.

Leak-proof throttle valve — bushed throttle valve eliminates air leakage and prolongs life.

Quieter, non-freezing exhaust — new Le Roi construction not only prevents freezing but also reduces noise.

Positive, thorough lubrication — large oil reservoir holds ample lubricant, assuring protection for all the working parts — and longer life.

Easy to inspect — self-locking thread on the back head and snap-in key on packing retainer permits easy assembly, disassembly, and packing adjustment. Butt, firmly held by a straight splined taper on the piston rod, can be quickly removed.

The Le Roi No. 11 Tamper weighs 34 pounds. It has a 1½-inch bore and a 7-inch stroke. Length overall is 47½ inches. Speed up your tamping operations — equip your men with new Le Roi No. 11's. See your nearest Le Roi distributor.

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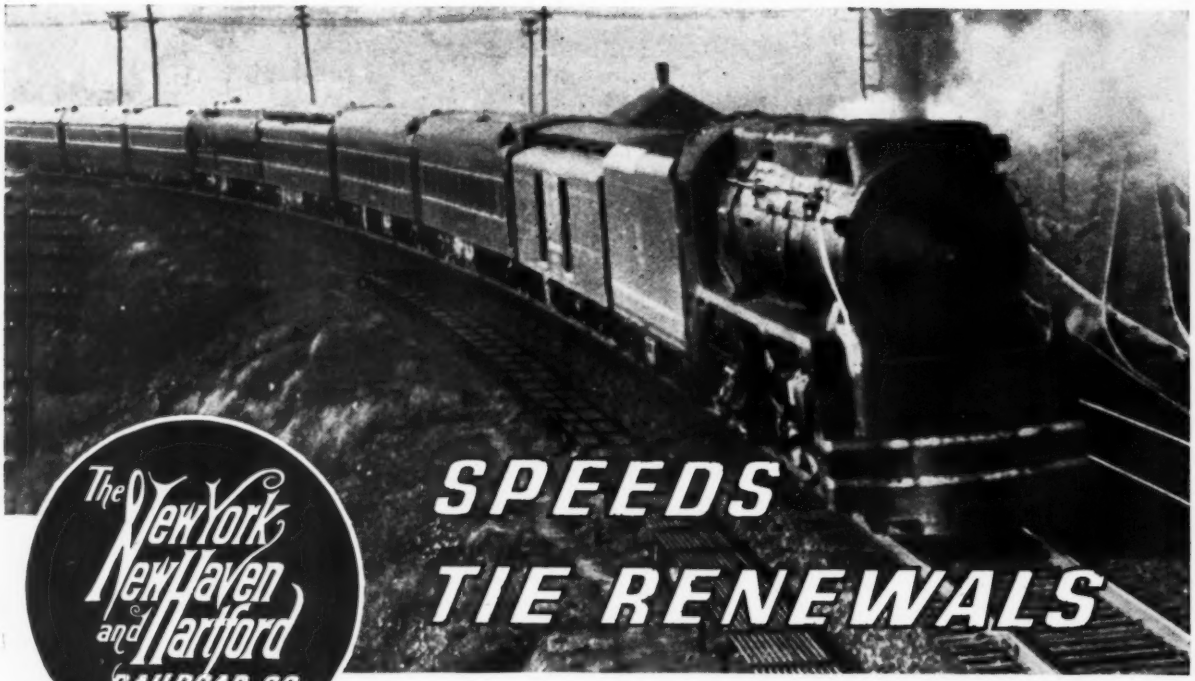


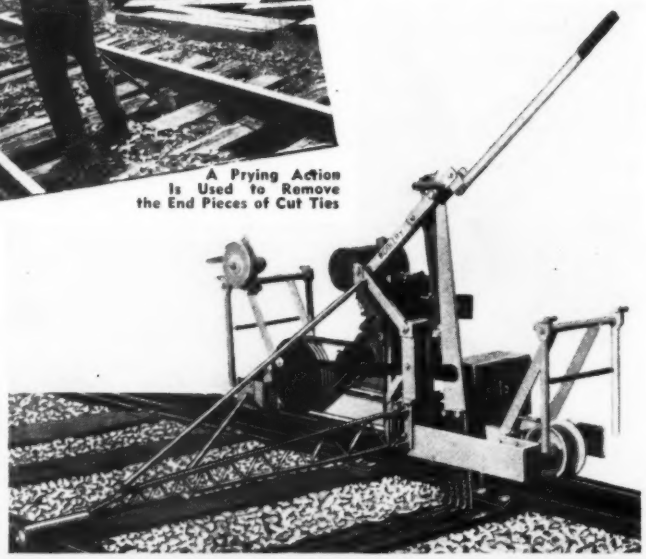
The New York New Haven and Hartford RAILROAD CO.

SPEEDS TIE RENEWALS

with WOOLERY TIE CUTTERS

To provide the refinement in track maintenance demanded by its Merchants Limited and its Yankee Clipper, flagships of a vast fleet of modern passenger trains, on one of America's busiest railways where every minute counts, the New Haven employs Woolery Tie Cutters to enable it to remove the hundreds of thousands of ties that require replacement in main and branch line tracks every year.

A Prying Action Is Used to Remove the End Pieces of Cut Ties



Hundreds of Woolery Tie Cutters being used by the railroads in America are helping them save up to 30% in tie renewal costs.

We invite your investigation. Let us give you operating cost and performance data.

WOOLERY TIE CUTTERS

The Woolery Tie Cutter saves labor in four ways—with it a skeleton crew can do the work of a regular gang—one man can operate the machine—its use eliminates cribbing and, because it leaves the tie-bed undisturbed ready for the new tie, tamping is reduced to a minimum.

THE MODEL "N" TIE CUTTER

is an improved machine at a substantial reduction in price. It eliminates the slow, laborious, back-breaking expensive features of tie replacement by old methods, without trenching or jacking up of track, and with a minimum of disturbance to ballast. A reciprocating cutting blade cuts tie into three pieces, at an average speed of 25 seconds per cut. Ends of the cut tie are easily pried out with a bar, using the center section as a heel. The center section is then lifted from the rail and a new tie seated on a firm permanent base requiring little or no tamping.

OTHER WOOLERY MAINTENANCE UNITS

Woolery Weed Burners and Creosote Sprayers are also helping many railroads maintain track the modern way with minimum expenditure of labor, time and money.

WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

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Here's the dirt on roadbeds...

and it's not good unless you get it out. The McWilliams "Mole" will clean your roadbeds for you quickly and efficiently. A crew of only four men can clean 850 to 1200 feet of shoulder in 8 hours with the shoulder model illustrated. Five men can do a similar job with the intertrack model.

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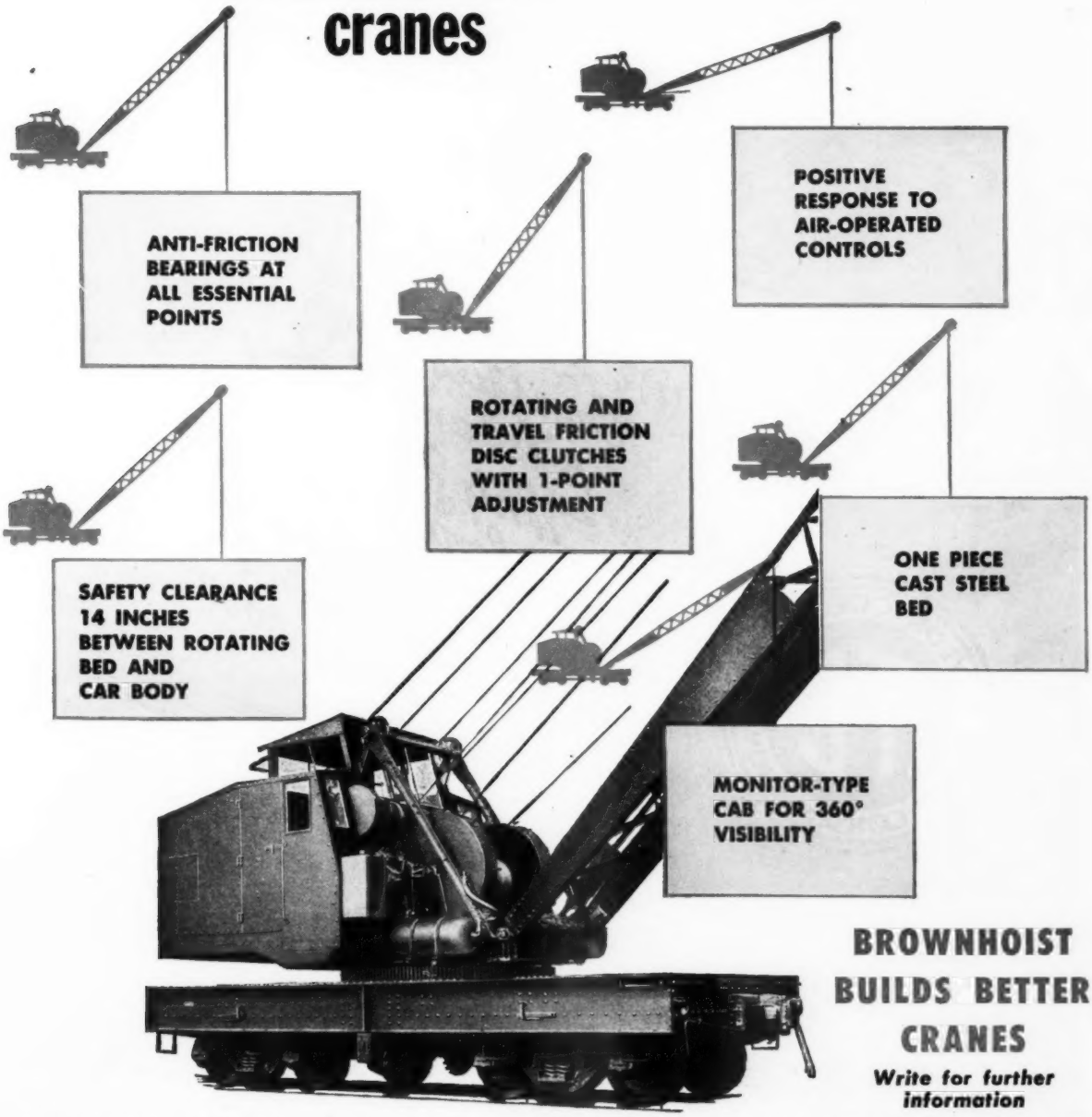
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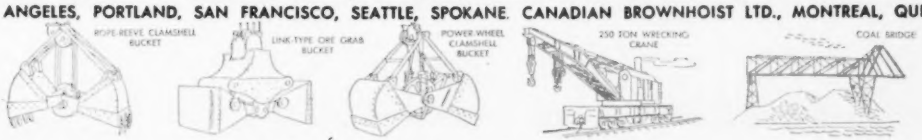

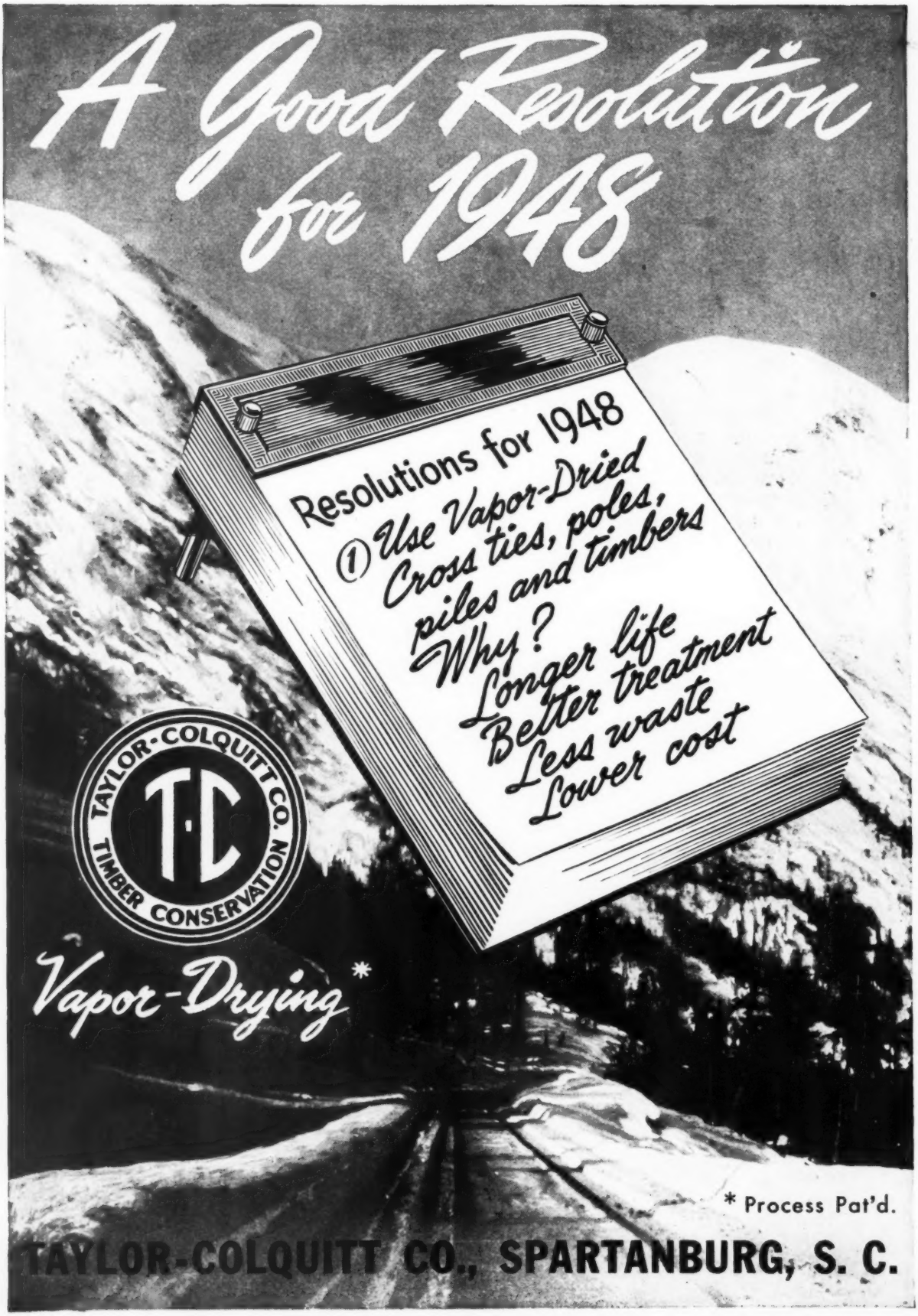
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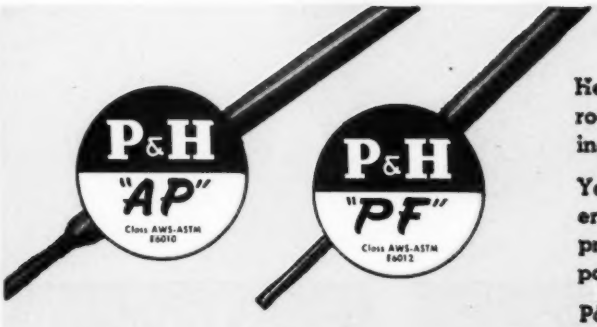
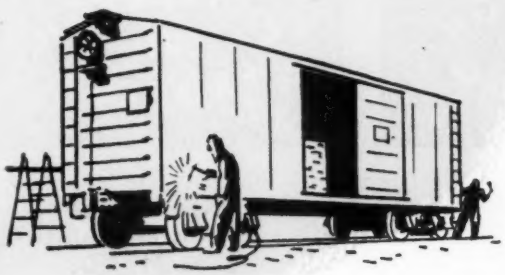


Here are two P&H Electrodes ideally suited to railroad work. You can do 90% of your mild steel welding with them.

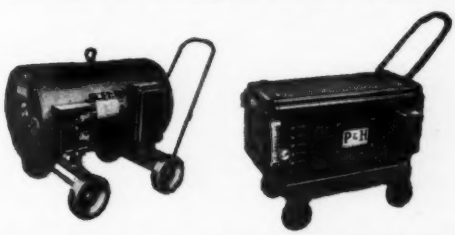
You benefit: with simpler electrode stocks, with fewer types and sizes, less waste . . . simpler welding procedures, more uniform results. But most important, lower welding costs.

P&H "AP" An unusual performing electrode suited for a wide range of mild steel welding, including welding of wrought iron and steel, boilers, locomotive frames, cars, cast steel, etc.

P&H "PF" For welding flues and boilers and on all types of general fabrication and repair-welding. Provides faster, surer welding, lower welding costs.



Learn more about these two P&H Electrodes — and the other AC-DC types, for welding all mild, alloy and stainless steels, and cast iron. Also types for building up and hard surfacing.



Two popular P&H Arc Welders for railroad welding. The Model WSR provides a Welding Service Range of from 60 to 500 amperes, the Model WA-200, 30 to 260 amperes. Also other 2 and 4-wheel Trailer Welders.

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Specialized equipment, employing hydraulic and mechanical methods, together with the "know-how" gained from thousands of tough pipe cleaning jobs, is your assurance that water supply lines can be THOROUGHLY cleaned! All incrustation, tuberculation and LARGE OBJECTS lodged in lines are removed to restore water systems to top capacity. Think of what this means in reduced pumping pressure, lower pumping costs, faster water servicing and increased fire protection: It pays to have pipes cleaned the Pittsburgh way!

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Pipe Lining for Water Mains 3″ to 24″ I.D.

Specify Pittsburgh-Eric Process on your next pipe cleaning job! After thorough cleaning, the pipe is lined with LECTUMEN which imparts a smooth, long-lasting trouble-proof coating to steel and C.I. water mains. LECTUMEN not only protects the pipe from underlying deterioration, but resists the accumulation of organic deposit within the main. The result is many additional years of service from existing mains at a fraction of the cost of **replacement.**

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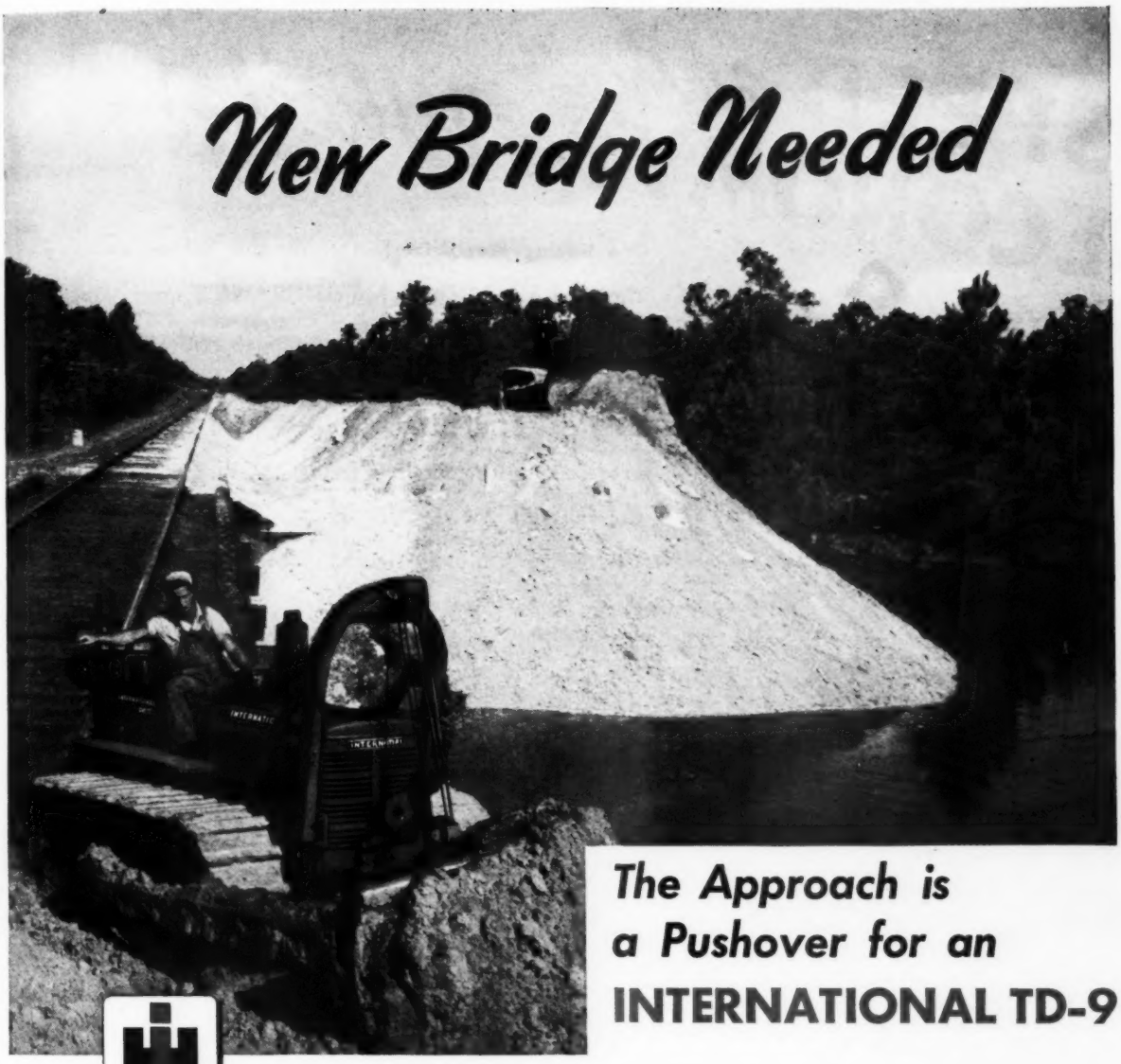

The Approach is a Pushover for an INTERNATIONAL TD-9

INTERNATIONAL HARVESTER

Building a new, higher bridge next to the old one crossing the Withlacochee River in Georgia required 50,000 yards of earth. Since the area is swampy, all the fill material for approaches had to be brought to the site in cars. Then the dirt was spread, pushed and leveled to grade by an International TD-9 Diesel Crawler.

The railroad bought this TD-9 in March, 1947, and had given it 1500 hours of punishing work when these pictures were made. No repairs have been needed and cost of operation has averaged $1.55 per 8-hour day for fuel and lubrication. That's economical work-power!

Tune in James Melton on "Harvest of Stars." NBC Sunday.

See your International Industrial Power Distributor for the tractors, power units and equipment you need. It's *good business* to standardize on International Diesels.

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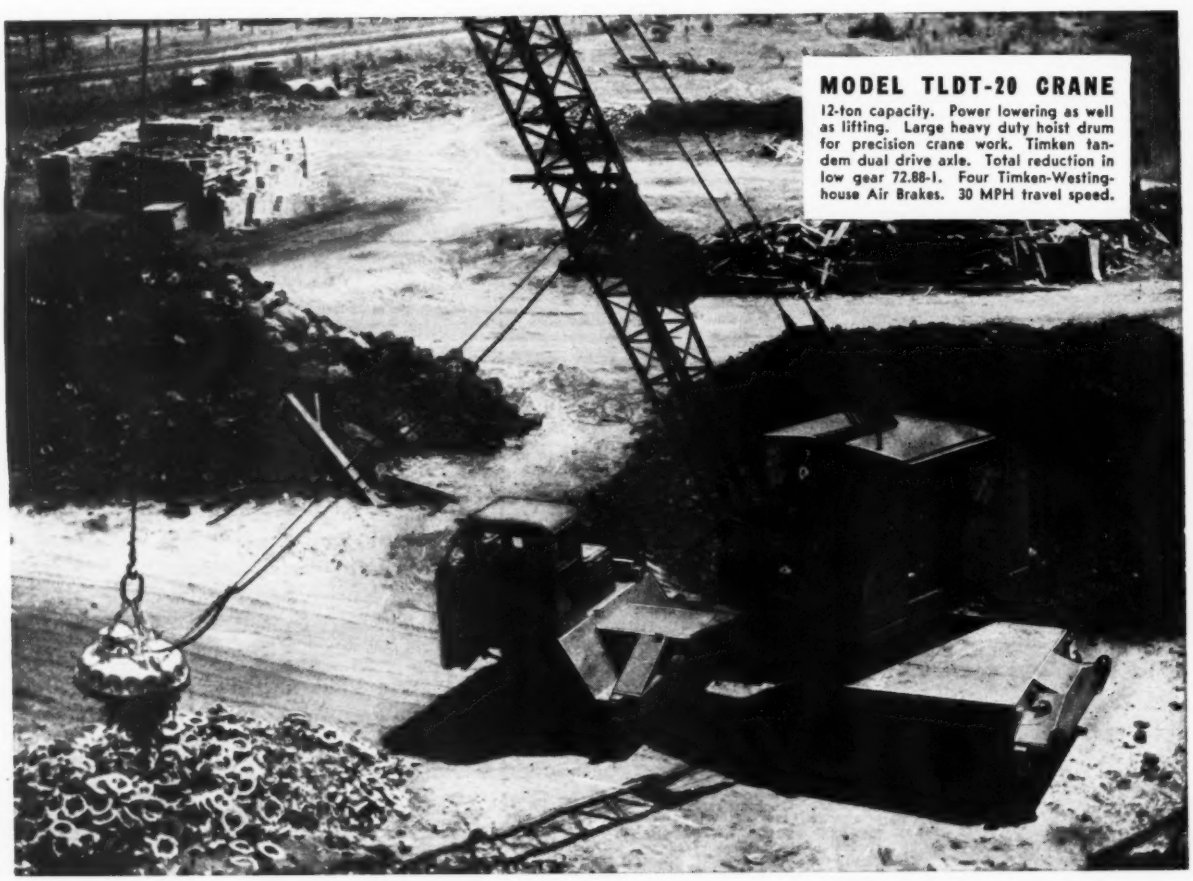
3/8 YD. and 1/2 YD. SHOVELS

6 to 12 TON CRANES

No waiting—no delays! Out on the job or around the yard MICHIGAN Mobile CRANE'S time-saving, cost-cutting operating speed, economy and truck mobility pays off on every lifting and excavating job. Long-time MICHIGAN owners will tell you that for crane, clamshell, dragline, trench hoe and shovel work the fully convertible MICHIGAN Mobile SHOVEL-CRANE is truly "speed and economy on wheels"!



MODEL TLDT-20 CRANE

12-ton capacity. Power lowering as well as lifting. Large heavy duty hoist drum for precision crane work. Timken tandem dual drive axle. Total reduction in low gear 72.88-1. Four Timken-Westinghouse Air Brakes. 30 MPH travel speed.

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POWER SHOVEL COMPANY

BENTON HARBOR MICHIGAN

For additional information, use postcard, pages 35-36

ADDITIONAL INFORMATION

On Any of the Products Mentioned in This Issue

Below is a complete index of the products referred to in both the editorial and advertising pages of this issue. If you desire additional information on any of them, use one of the accompanying addressed and stamped postcards in requesting it. In each case give name of product and page number. The information will come to you directly from the manufacturer involved, without any obligation on your part.

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READER SERVICE DEPT.

RAILWAY ENGINEERING AND MAINTENANCE January, 1948

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☐ Literature Only ☐ Desire to see Representative ☐ Price Data

Product and Page No. .....
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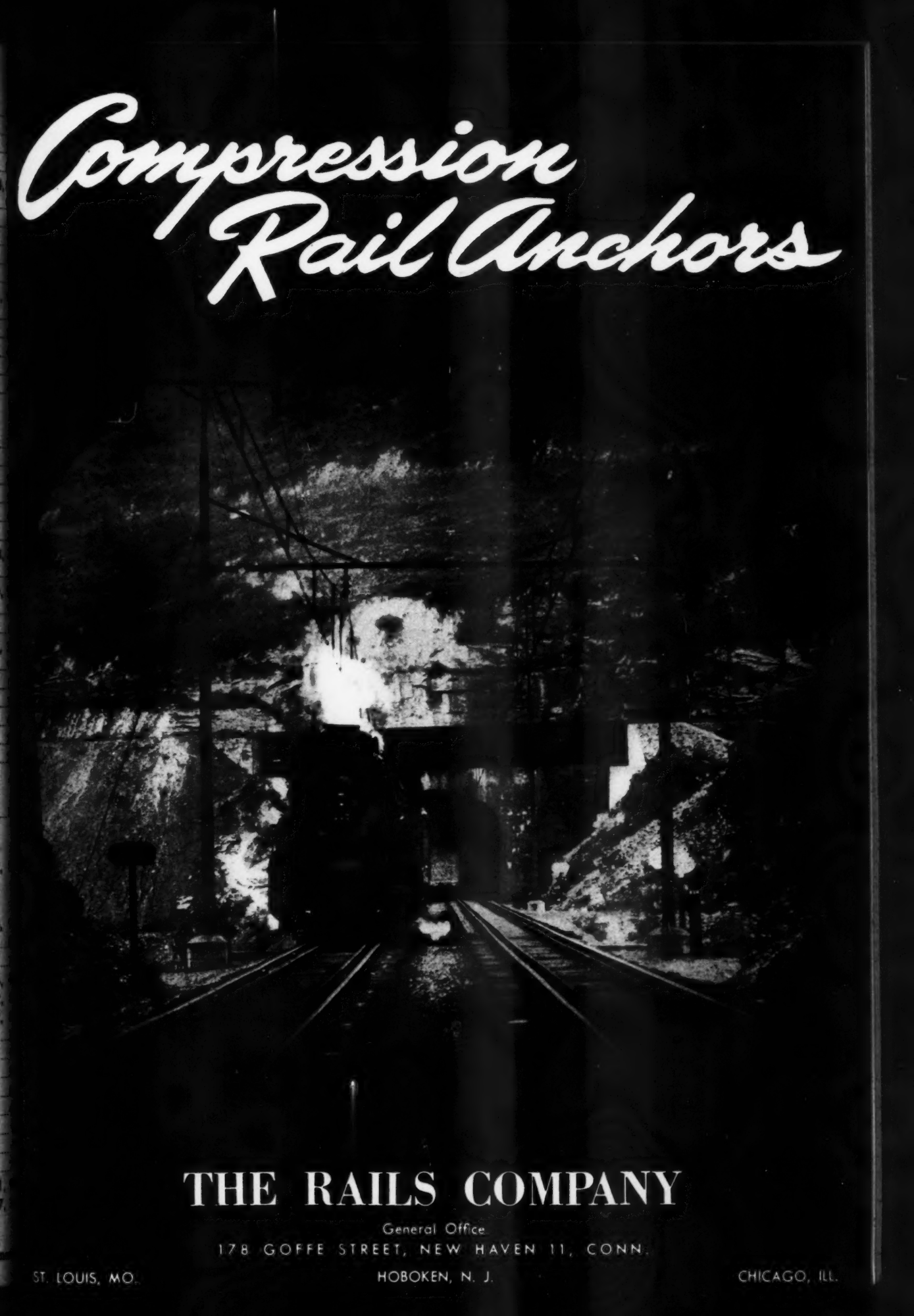

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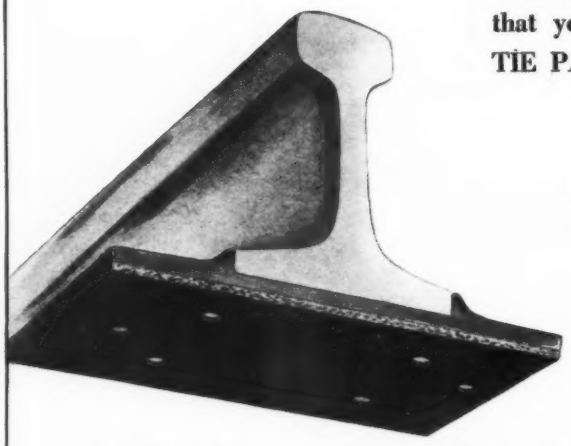

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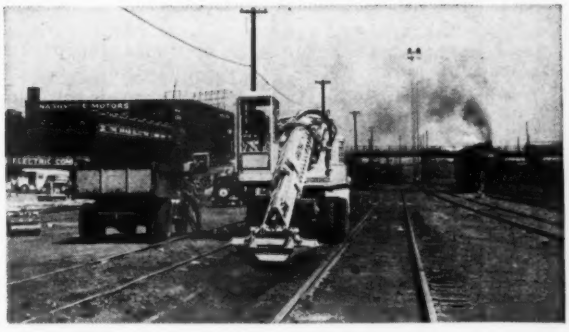

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No. 229 of a Series

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Engineering and Maintenance

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Subject: Best and First

January 1, 1948

Dear Readers:

Getting out Railway Engineering and Maintenance for you each month is an interesting and satisfying job. Interesting, because of the contacts it affords with so many of you in your offices, in the field, and in association work, and because of the first-hand information gained of at least the more interesting things you are doing—and satisfying because of the service we can render to you and because of your appreciation of that service.

But with this feeling of interest and satisfaction comes a sense of great responsibility, bordering on deep concern at times, because of the admitted impossibility of reporting all of the many developments in the field, and with the thoroughness and accuracy that has always been a mark of distinction of our publication.

Imagine, if you can, the responsibility we felt with the receipt of no less than twelve unsolicited letters early in December, from engineering and maintenance officers from assistant supervisor of bridges and buildings to engineer of track, each in its own way telling us of the value of Maintenance to them, and almost invariably commenting on the thoroughness with which we present the subjects treated. Some commented also upon the dependence they can always put on the accuracy of the material presented in our pages. Still others commented on the timeliness of the subjects treated.

We would like to think that we are always first to you with the information you want and need, but we are conscious that speed in presentation is not always compatible with the qualities of thoroughness and accuracy. That this is true will be evident to any of you who have done any amount of field investigation work and reporting. Beside, whether you have realized it or not, nothing goes into Maintenance unless it has been checked and double-checked—even contributed material—and all feature articles describing the practices of specific roads also bear the stamp of "accuracy" of the roads involved.

More serious often in any delay in presenting material is the request at times by our railroad friends that—for one reason or another—we postpone consideration of developments, installations or methods on their lines until they can be written about more factually—especially as to results. One such request or suggestion comes in as I write this letter, and relates to a ballast test installation in which there would be widespread interest. It comes from a chief engineer, who says in part, "I do not feel that any publicity should be given to this test installation at this time."

All of the factors that from time to time make it impossible for us to "cover the field" promptly are as disappointing to us as we know they are to you. But when it comes to a choice between rushed and inadequate coverage, with the risk of inaccuracy, or an orderly presentation, with thoroughness and accuracy, we are confident that you want the latter. If we are wrong, please tell us. In the meantime, our aim in 1948, as in the past, will be to cover for you the most interesting and helpful developments in the field—always thoroughly and accurately, and always first to the extent that that is humanly possible. We hope that following this policy will contribute materially to making the new year a pleasant and profitable one for you.

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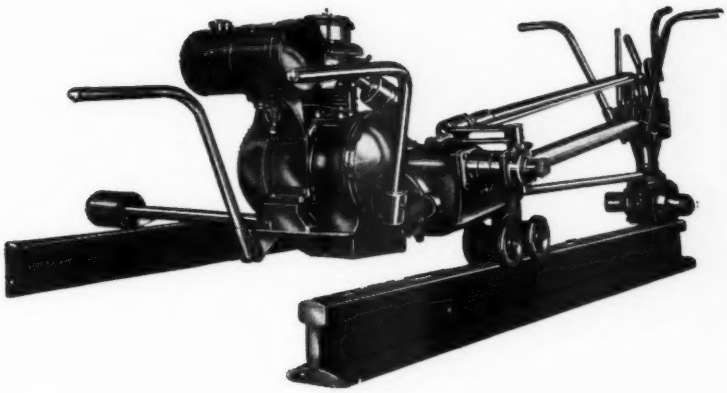

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Railway Engineering and Maintenance

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JANUARY, 1948

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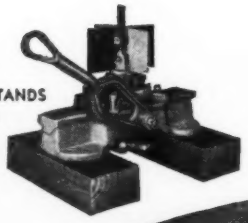

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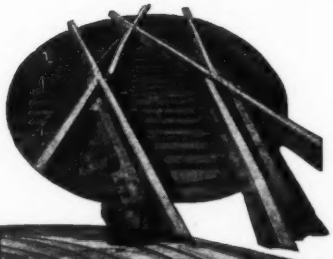

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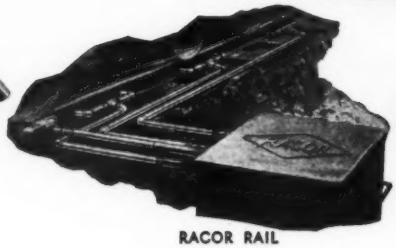

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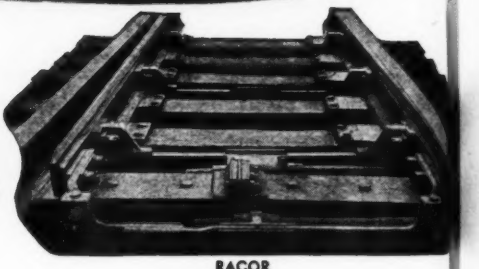

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Railway Engineering and Maintenance

1947 in Review—

A Strenuous Year, With Many Signs for Encouragement

The year 1947, in spite of postwar transition difficulties that continued to disturb nearly all phases of the economic life of the country, was a strenuous one for the railways, but it saw the financial results of railway operations somewhat better than those in 1946, and a general advance in both the physical condition of the roads as a whole and their service to the public.

A detailed review of what took place on the railroads in 1947 and the reasons therefore would fill volumes, and, obviously, is beyond the scope of this issue, but, as of vital importance to every railway officer and employee who reads these pages, there is presented here a summary of comments and statistics taken from a comprehensive review of railway operations in 1947, prepared by Dr. Julius H. Parmelee, vice-president and director, Bureau of Railway Economics, Association of American Railroads, supplemented by staff-compiled data relative to construction and maintenance activities.

Total loadings of revenue freight, estimated at 44,537,000 cars in 1947, were more than 3,000,000 cars, or 7.7 per cent, over 1946, and in greater volume than in any year since 1930, surpassing even the loadings of the war years 1941 to 1945.

Revenue ton-miles, estimated at 647,359,000,000, attained a new peacetime record in 1947, exceeding in number every preceding year except 1943 to 1945. The aggregate for the year, while 12.2 per cent below the wartime peak year 1944, was 44.7 per cent greater than in 1929, the peak year prior to World War II, and 94.1 per cent above 1939.

The decline in passenger traffic which started in 1946 continued throughout 1947. Passenger-miles for the year are estimated at 44.8 billion, a decline of 30.7 per cent below 1946 and 53.1 per cent below 1944, the year in which war traffic reached its peak. The 1947 volume was, however, the greatest for any peacetime year save 1920, and about twice the volume handled in 1939.

Rising costs of railway operation in 1947 may be measured by a weighted index of railroad wages, material prices and payroll taxes. That index was higher in December, 1947, than the average of 1946 by 19.2 per cent, and higher than in 1939 by 75.6 per cent. The railroad payroll, in spite of about 3,000 fewer employees than in 1946, aggregated $4,350 million, the greatest in history, and an increase over 1946 of $180 million.

Increases in wage rates of 15½ cents an hour were granted to more than a million non-operating employees on September 1, and to 175,000 conductors and trainmen on November 1, which brought the average straight-time rate of pay for all railroad employees up to $1.26 an hour, compared with $0.74 in 1939. The wage increase, calculated on the basis of 1946 employment, added $516,980,000 per year to railroad payrolls, and the increase in payroll taxes resulting added $34,901,000 per annum—a total increase in labor costs of $551,881,000.

Material prices continued to rise in 1947. This was especially true in the case of coal, which bulks so large in railroad purchases, but was also true of many other important supplies, such as iron and steel products, ties and lumber. The index during 1947 increased from 208.5 (December, 1946) to 248.1 in December, 1947, an increase of 19 per cent. Applied to 1946 purchases, which amounted to $1,570 million, this increase of 19 per cent represented an additional cost for railroad supplies in 1947 amounting to nearly $300 million.

These increases in operating cost factors, cumulatively affecting the aggregate of operating expenses and taxes, rendered the freight rate increase of 17.6 per cent, effective January 1, 1947, inadequate, and made it neces-

sary for the railroads to apply for other increases in the freight-rate level during the year, which added up to an average increase of 29.2 per cent. After a series of hearings the Interstate Commerce Commission authorized an interim increase of 8.9 per cent as of October 13, and as the year closed, on Dec. 30, upped the increase to 20 per cent, but only until June 30, 1948.

Financial Results Somewhat Improved

The general, financial results of railroad operations in 1947 were somewhat better than those in 1946—but the net results were below reasonable requirements. Freight revenue during the year exceeded that of 1946 by $1,205 million, or 21 per cent, and total operating revenues were greater by $954 million, or 12½ per cent. Operating expenses and taxes increased $806 million, or 12 per cent. Net railway operating income, at $748 million, showed an appreciable increase over the $620 million of 1946, but represented a rate of return of only 3.32 per cent on the net investment of the carriers (after depreciation and amortization).

Because of an excess of equipment retirement over new installations, the railroads owned fewer locomotives and freight cars at the end of 1947 than at the beginning. Deliveries of new freight and passenger cars ran below expectations, and far below the number required for prompt handling of available traffic. Even so, the railroads operated in 1947 with the greatest efficiency ever recorded in a year of peace.

Maintenance Higher—But Not Enough

Expenditures for maintenance of way and structures were higher in 1947 than in 1946, but throughout the year various factors extending over from the war period and inherent in the postwar readjustment period continued to prevent activity from reaching the level indicated as necessary by the large amount of traffic being carried, the need for improving the properties for better service, and the necessity of making up the large amount of deferred maintenance that accumulated during the war years.

Based upon official figures for the first nine months of the year, it is estimated that the total expenditures of the Class I railroads for maintenance of way and structures in 1947 amounted to approximately $1,210,000,000. An increase of 5.2 per cent over expenditures for like purposes in 1946, this figure has been exceeded only twice before in history, namely, 1944 and 1945. Likewise, this figure gives 1947 the distinction of being the fifth consecutive year in which total expenditures for maintenance have exceeded the billion-dollar mark. However, in employing the dollar expenditures for 1947 as an indication of activity, one cannot overlook the many factors which tended, on an increasing scale during the year, to inflate the costs of doing maintenance work as compared with earlier years—including the further increases in hourly wages and continuing increases in the prices for practically all materials and equipment used by the maintenance forces. In fact, taking these influences into consideration, the actual amount of maintenance work accomplished during 1947 was somewhat disappointing, and far below what was actually needed.

Probably the most encouraging aspect of 1947's maintenance activity was the increased rail renewals as compared with 1946. Based upon information furnished by practically all the Class I roads of the country, it is estimated that these roads laid in renewals 1,422,000 gross tons, which represents an increase of 198,000 gross tons, or 16.2 per cent, compared with 1946. Furthermore, with the exception of the years 1944 and 1945, rail renewals last year were higher than for any year since 1930.

Unlike rail renewals, the number of crossties renewed during 1947 showed a slight decrease, the number—again an estimate based upon figures furnished by most of the Class I roads—being 37,400,000, a decline of 162,000, or 0.4 per cent, compared with 1946. Thus, tie renewals were down to the lowest level that has prevailed for many years, being only slightly above the low point of the depression reached in 1933 when 37,295,716 crossties were inserted in tracks.

Improvement Work Up

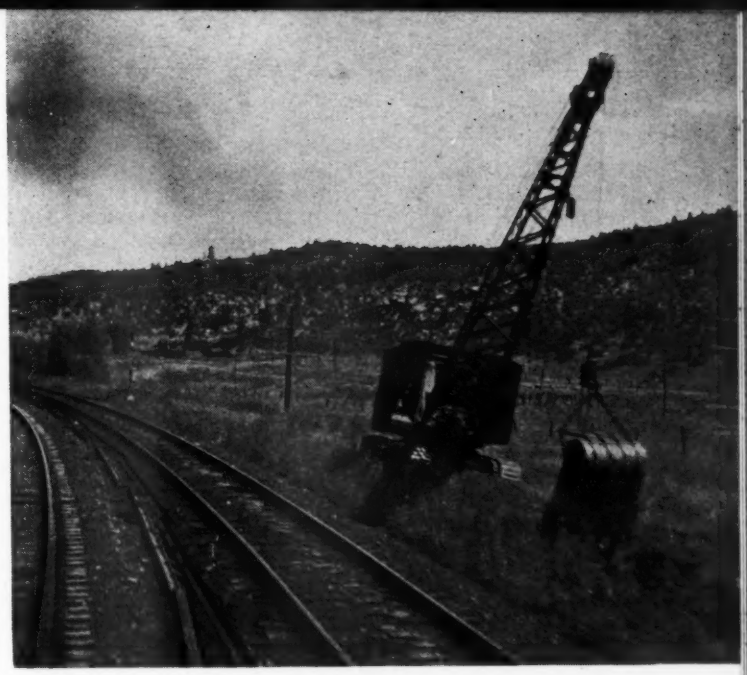
In additions and betterments, 1947 was a relatively active year. Based upon actual expenditures during the first half, plus estimates by the Interstate Commerce Commission for the last two quarters, it is expected that the Class I line-haul roads of the country spent about $286,000,000 during the year for improvements to roadway and structures. If this proves to be the case, this will represent an increase of $55,000,000 as compared with 1946, and, in dollar volume, a larger amount of betterment work than was carried out in any year since 1931, when expenditures amounted to $288,807,000. However, because of the increased cost of labor and materials, it must be evident that, as compared with earlier years, the amount of work actually done was not as great as indicated by the figures.

To carry out their maintenance and improvement work, as pointed out in detail in the lead article, in this issue, the railways of the country ordered approximately 9,500 units of power machines and tools, at an estimated cost of about $19,100,000. This represents a slight drop in the number of units purchased as compared with 1946, but the dollar volume, due to higher unit prices, was up approximately $3,600,000.

Prospects for 1948

What's ahead for the railroads in 1948? This, no one can know with certainty, but if present economic conditions, present trends, and the needs of the country for more and better transportation than ever before in peacetime, offer any indication, the year ahead should be a busy and profitable one. In turn, this should be reflected in still greater activity in construction and maintenance and increased purchases of power tools and machines with which to carry forward this work.

One thing is certain—confronted with a large backlog of needed improvements to their fixed properties, and deferred maintenance in their tracks which, according to a report of the Engineering Section of the Interstate Commerce Commission's Bureau of Valuation, dated October 30, amounts to more than $440,000,000, the need for large programs of construction and maintenance in 1948 is great. It is equally certain that, given any kind of "breaks" during the year, the railroads will endeavor to overcome this need to the greatest extent possible.



Heavy Grading Equipment of All Types Was Purchased Widely During 1947

Based on reports from 426 companies it is estimated that the railroads as a whole purchased 9,500 power machines and tools last year, only moderately below the record level of recent years. Prospects are favorable for continued active purchases in 1948

Railways Spent $19,100,000 for Work Equipment in 1947

THE railroads of the United States, Canada and Mexico were in the market for work equipment in 1947 on a moderately active basis. Specifically, it is estimated that these roads purchased a total of 9,500 units of work equipment costing approximately $19,100,000. While the dollar figure is the highest ever reached, due partly to increased unit costs, the number of machines purchased is moderately under the high records established during the last few years, but is far above the purchases for any year prior to 1944.

The figure showing the number of units of work equipment purchased in 1947 is an estimate based on answers to a questionnaire that was sent to all the railways of the United States, Canada and Mexico. Replies were received from 426 roads, the equivalent of 80 per cent of all the railways in these three countries, and including all but four Class I roads in the United States and one large road in Canada. Of this number 174 railroads reported purchases of work equipment totalling 8,450 units. The number of roads reporting purchases represents an increase of 14 as compared with 1946, when 160 companies announced that they had bought 9,939 pieces of equipment.

Notwithstanding the surface aspects of these comparative figures for 1947 and 1946, the fact is that the majority of railroads reported increased purchases for 1947. The decrease in total purchases in the face of this situation is explained by the fact that a few of the larger companies made rather sharp reductions in the number of machines acquired. Specifically, while the total reported purchases in 1947 were 1,489 units less than in 1946, seven of the larger roads alone reported the purchase of a total of 2,250 fewer units in 1947 than in the previous year.

Purchases for 1947 Included 918 Units of Equipment for Use in Rail-Laying Operations

Purchases Remain at High Level

That the purchase of work equipment has become established at a much higher level than existed in previous years is shown by the following yearly purchase figures since 1937, the first year of record: 1937—3,310 units, $5,000,000; 1938—1,376 units, $2,000,000; 1939—3,547 units, $6,000,000; 1940—5,414 units, $7,250,000; 1941—8,007 units, $10,500,000; 1942—7,612 units, $10,270,000; 1943—

8,507 units, $12,300,000; 1944—9,984 units, $14,400,000; and 1945—11,733 units, $17,500,000.

The high level of work-equipment purchases in 1947 as compared with the years prior to the peak established during the war years is a reflection of a combination of factors, of which one of the most important is the continuing high level of traffic carried by the railroads, necessitating large work programs to assure that the properties will be maintained to the high standards required today. Another factor stimulating purchases has been the steady upward trend of wage rates. The continued employment of power-driven machines, and the intensification of their use wherever possible, comprise the most effective means available for helping to keep costs down in the face of rising wages.

Also helping to bolster work equipment purchases is the introduction of new or improved types of machines. No better demonstration of the value of, or market for, work equipment is available than to perceive how the railroads "go for" new or improved machines that promise large returns in the way of higher quality work done at minimum cost.

Some Retarding Influences

Counteracting these favorable factors tending to stimulate purchases of work equipment in 1947 were a number of developments that had a retarding effect. Among these were the somewhat restricted amounts of maintenance work in certain categories that prevailed during the year, primarily because of shortages of men and materials. Another factor that acted as a brake on purchases was the sharply-increased prices for certain types of equipment. A logical consequence was the cutting back of orders when the appropriation was found inadequate to cover the price of the original number of units contemplated.

Also acting to retard purchases of work equipment in 1947 on some roads were the effects of large purchases that have been made during the last few years. However, wherever the need for work equipment has been temporarily reduced for this reason, it can be expected that the companies involved will be back in the market on an active basis at a relatively early date. Furthermore, since extensive development work was conducted by a number of individual manufacturers, involving the redesigning or complete remodeling of their products, their sales activity was naturally carried on at a slower tempo. Moreover, knowing that such development work was in progress, some railroads held back orders for equipment awaiting the new models or adequate service tests of their performance.

Motor Cars Top List

Turning to a discussion of the purchases of equipment in 1947 by individual categories, it was to be expected that purchases of motor cars would again top the list, as they have done in all previous years. Specifically, the 174 railroads reporting purchases of work equipment in 1947 bought a total of 2,298 motor cars. The continuing substantial purchases of these units demonstrates the stable nature of the market for them; however, while motor car purchases in 1947 were larger than for any year of record prior to 1941, they were somewhat below the near record purchases of recent years, comparing with reported purchases of 2,877 motor cars in 1946 and 2,738 in 1945.

Purchases of push cars and trailers also continued close to the high level prevailing in recent years. A total of 1,100 such units was acquired by the railroads reporting purchases in 1947, which compares with reported purchases of 1,289 such units in 1946.

Another important element of the railroads' purchases of transportation units in 1947 was the acquisition, by the railroads reporting, of a total of 751 highway vehicles, including automobiles, trucks, trailers and station wagons. This compares with a total of 554 such units purchased in 1946, and 410 in 1945.

Many Grading Machines

The growing interest of the railroads in acquiring large numbers of modern types of grading equipment received further emphasis during the year, as evidenced by the fact that a total of 290 such machines was purchased by the railroads reporting. Only twice before has this figure been exceeded, namely, in 1946 and 1945, when the reported purchases were 301 and 505 units, respectively. Included among the grading units acquired last year were 47 draglines and shovels and combinations of such units, 143 tractors of all types, 45 bulldozers and angledozers, 18 scrapers, 4 graders, 6 rollers and 25 buckets. They also included a considerable number of dump trucks which are incorporated in the figure mentioned previously showing the purchases of highway vehicles.

Rail-Laying Equipment

Reported purchases of equipment used in laying rail were somewhat below those of the last three previous years but far above any year prior to 1944. Since the railroads laid an estimated 1,422,000 gross tons of rail last year, an increase of 16 per cent as compared with 1946, and only moderately below the 15-year peak established in 1945, it is only logical to conclude that available rail-laying equipment was not only used more intensively last year but that many units of equipment were continued in use that otherwise would have been retired due to obsolescence or other factors. It is reasonable to expect, therefore, that the temporary lull in purchases of rail-laying equipment will be followed by greater activity in the acquisition of such equipment in the near future.

To be specific, the railroads participating in this survey reported the

Roadbed-Stabilization Projects Required Considerable Equipment in 1947

purchase in 1947 of a total of 918 units of equipment used in laying rail, which included 27 cranes, 191 bolt tighteners, 131 spike drivers, 35 spike pullers, 65 power adzers, 245 rail drills, 114 grinders and 110 power rail saws. The roads also acquired a number of cribbing machines of the type used in rail-laying work, but these machines are lumped with other types of cribbing units and included later in this article in the total units, purchased for ballasting and surfacing work.

Ballasting and Surfacing

Purchases of equipment used in carrying out ballasting and surfacing programs again failed to reflect the actual needs of the carriers for equipment of this type—needs based on the extensive programs of such work that are necessary today to take care of current requirements and to make up for the large amount of undermaintenance that has accumulated in this category of work. For several consecutive years the railroads' ballasting and surfacing programs have been handicapped by a shortage of labor, and for this reason it is obvious that strenuous efforts will have to be made in the future to bring the tracks up to the standards of surface and line required by present-day operating conditions.

Because of the enforced curtailment of ballasting and surfacing programs in 1947 the number of work-equipment units purchased during the year specifically for such programs amounted only to 869 machines, compared with 1,086 in 1946. These included power jacks, tie-tamping outfits and unit tampers, ballasting machines, cribbers, and ballast-cleaning equipment.

Notwithstanding the overall reduction in the number of ballasting and surfacing machines purchased in 1947 there was an increase in the number of tie-tamping outfits acquired. Specifically, a total of 412 complete outfits of this type was purchased, as compared with 352 reported for 1946. Included in the total for 1947 are a considerable number of tamping machines of the large or gang type. Reported purchases of tamping equipment during the year also included a total of 332 unit tampers, which compares with 537 such units acquired in 1946.

Power Plants

The tie-tamping outfits purchased in 1947, as well as the welding outfits and paint-spraying units mentioned later, all include the power plants necessary for their operation. In addition, the railroads were in the market for a substantial number of other power plants to replace worn-out units of the same type and also to operate the small portable tools used in bridge and building work. In 1947 the purchases of these additional power plants included 151 air compressors and 120 generators, compared with 136 air compressors and 243 generators in 1946. Comparable reported purchases for 1945 included 201 air compressors and 266 generators.

Motor Cars and Trailers, of Which a Total of 3398 Were Purchased Last Year, Head the List of New Units Purchased

The railroads continued in 1947 to acquire cranes in considerable quantities. Including the rail-laying cranes mentioned proviously, a total of 94 cranes of all types was purchased by the railroads reporting. While this compares with 130 cranes reported purchased in 1946, and 119 in 1945, it is higher than for any previous year of record. The figure for crane purchases does not include derrick cars, of which 45 were acquired by the railroads making reports.

To aid them in carrying out programs for controlling and eradicating weeds, the railroads submitting figures reported the purchase of a total of 235 machines of various types. This compares with reported purchases in this category of 237 machines in 1946 and 279 in 1945. It includes discers and scarifiers, chemical spraying outfits, hand and track-type weed burners, and both on and off-track mowing machines.

Many other types of machines were also reported purchased in 1947, including 18 grouting outfits, 334 rail and flange lubricators, 118 paint-spraying outfits, 45 paving breakers, 98 pumps of various types, 162 timber saws, 78 wood borers, 72 concrete mixers and 46 welding outfits.

Looking ahead at the prospects for work equipment purchases for 1948, it can only be said that every indication points to the need for large purchasers in that year. Work-equipment purchases must obviously be more or less in direct proportion to the amount of work done, and there is every reason to believe that, barring unforeseen developments, work programs in 1948 will on the whole be larger.

Another factor that is certain to stimulate work-equipment purchases in 1948 is the prevailing high level of wages, coupled with the ever-present need for keeping costs under control. Power machines and tools comprise the best antidote yet developed for this situation and the need for such an antidote in large quantitties is self-evident. Still another consideration in determining work-equipment purchases in the immediate future is the increasing willingness on the part of equipment builders to redesign existing machines or to build new ones to meet the needs and the specifications of the railways—and the fact that much of the development work carried out in 1947 will be translated into orders for 1948.

A limited preliminary survey undertaken among a number of roads indicate that present plans call for the purchase of about the same amount of work equipment this year as in 1947. However, it is known that a number of roads are planning, after a comparative lull in 1947, to re-enter the market in a big way in 1948—one indicating that it expects to purchase ten times as much equipment in the year ahead as in the past year.

Some "Tips" on the Latest Use of

Driver Burns, Corrugations and Hardening of Open-Hearth Frogs

By C. A. Daley

Maintenance of Way Engineer
Technical Sales Division
Air Reduction Sales Company
New York

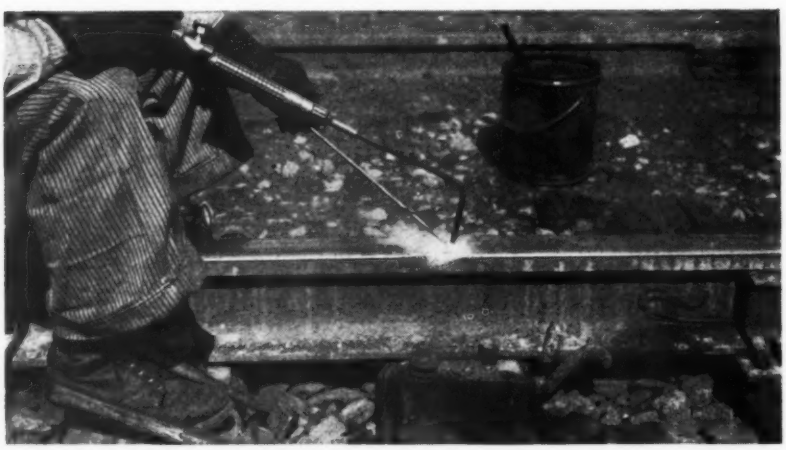
A WHEEL or driver burn in a rail may look like a very insignificant surface damage to the rail, but, in reality, it may be very serious and the cause of a progressive fracture.

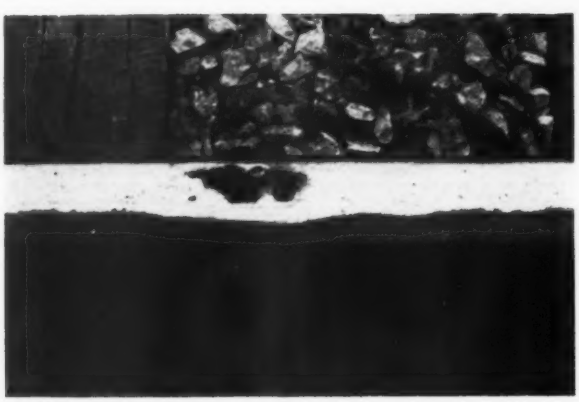
The friction between the drivers and the rail in case of a spin generates enough heat to raise the temperature of the rail above the critical point of rail steel. Since the mass of cold metal in the rail acts as a quenching agent, the result is to produce a hard martensitic structure in the rail at the point of slippage. This hard, brittle metal will eventually shell out, causing a depression in the rail, and, in many cases, the burn may cause an incipient fracture which, if left undisturbed, will eventually grow under traffic and cause the rail to break.

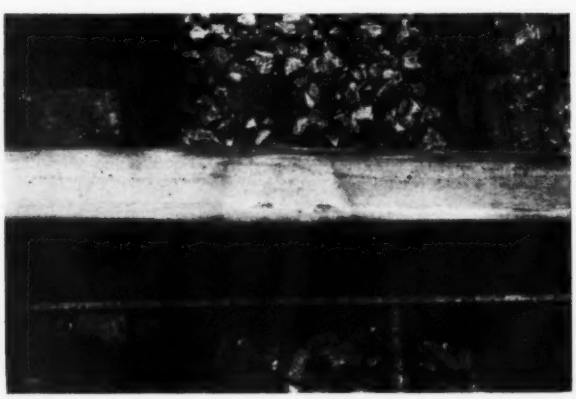
In building up driver burns, all loose or laminated metal which cannot be removed with a cold chisel should be ground out or washed out with a welding or gouging tip, without heating the rail any more than necessary. If the grinder is used, the ground area should be washed clean with a torch before starting the weld. During this washing-out operation, the operator should be on the lookout for any possible incipient fracture, which, if present, will be readily discernible. In the event a fracture is found, the metal should be washed out to the bottom of the track and then welded up. In the event the fracture is extensive, the rail should be replaced.

If the wheel burn is over 4 in. long, it should be built up in increments of about 3 in. in order to keep the heat input in the rail to a minimum. Since there are from four to eight burns in one slippage, depending on the size of the locomotive, the welder can move from one burn to another without losing any time waiting for the weld to cool. The weld can be surface finished with either a flatter or a grinder.

Many roads are now building up wheel burns, using the method described, and thereby are avoiding the need for replacing a large number of rails.







Left—The Building Up of Driver Burns by Welding Should Follow a Definite Procedure. Left Below—Driver Burns Like This One Can Have Serious Consequences. Below—A Driver Burn That Has Been Built Up by Oxyacetylene Welding

Corrugated Rails

Probably the most recent development in the use of the oxyacetylene torch in railroad track maintenance is the tempering of hard spots in corrugated rails.

Corrugations often develop in rails to such an extent as to cause what

(*Continued on page* 53)

# of Oxyacetylene Flame In Track Work

Representatives of two foremost welding apparatus manufacturers and service organizations serving roadway departments of the railways discuss rail-end hardening, flame-hardening of open-hearth frogs, building up driver burns in rails, and flame treating of corrugated rails*

Hardening Rail Ends and Frogs

By R. W. Torbert

Assistant to Vice-President
The Oxweld Railroad Service Company
Chicago

UNDER the pounding of present-day traffic, and the higher cost of rail and track maintenance generally, rail-end hardening, properly done, is more important today than ever before.

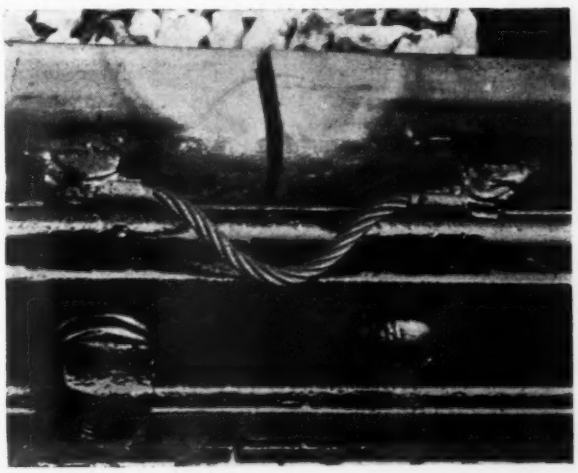
The hardened area of rail ends must have three characteristics. First, it must be tough and have sufficient depth to provide longer service life; second, it must have sufficient hardness to retard wear, and at the same time wear uniformly with the balance of the rail; and third, the hardened area should have a pattern that permits uniform transition between the hardened area and the unhardened area.

Preliminary investigation in the early thirties indicated that proper hardness could be obtained by heating the rails and then using a water-quench to produce the desired hardness. However, operations in the field subsequently disclosed that, using this method, it was difficult to obtain uniform results. Further investigation showed that employing the mass of rail itself as the quenching medium provided sufficient hardness when the head metal was heated quickly to the proper pattern. This quick heat input was made possible by the use of multiple oxyacetylene flames. Since this disclosure, millions of rail ends have been end-hardened successfully through careful control of the application of the heat, and the employment of the rail itself as the only quenching medium.

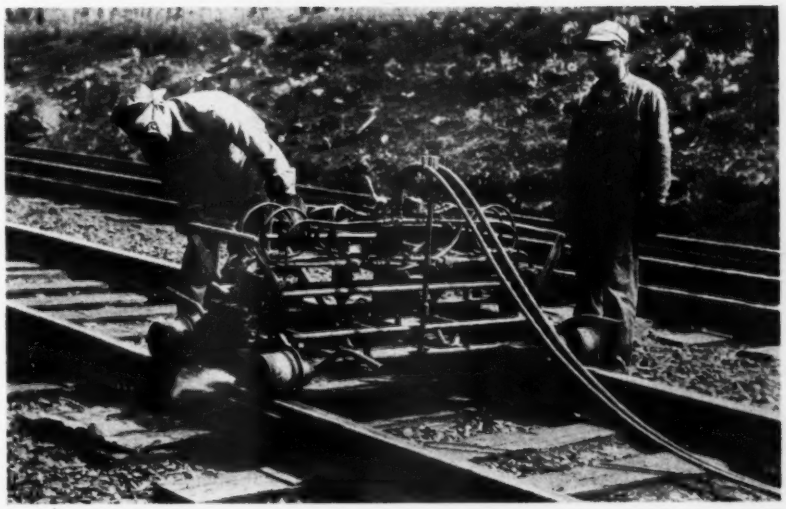
Machines of special design are used for the end-hardening operation, and, as shown in one of the accompanying illustration, are mounted on four-wheeled trucks for ready movement from joint to joint. These machines are equipped with two sets of hardening heads, one lying over each line of rails, so that the ends in both lines of rails can be treated progressively without turning the machines.

Each hardening head consists of two adjustable blocks, each with three large oxyacetylene heating tips. As mounted over the rail, four of the tips lie along the gage side, while the other two are at the outside of the rail head. In the heat-treating process, the machine as a whole is spotted cen-

Right — Rail Ends that Have Been Heat-Treated in Track by the Machine Method



Below—Machine in Operation for Hardening Rail Ends in Track



*Abstracted from papers presented before the twenty-eighth annual meeting of the American Welding Society in Chicago, during the week of October 19, 1947.

Brinell Hardness Pattern

351	255	262
340	321	340
340	332	351

Showing Pattern at Rail End of Area Heat-Treated in Track by the Machine Method. Tabulation at Right Shows Brinell Hardness Readings Which Correspond, as to Location, with the Impressions in Rail End Formed When Hardness Test Was Made

trally over the rail joint, and the heating heads are moved laterally across the head by a hand-operated oscillating mechanism. This prevents burning of the head metal during the heating operation, and produces a heated area on each rail end shaped very much like a butterfly's wing, with the longer edge on the gage side.

Five manifolded acetylene cylinders and oxygen cylinder furnish the required acetylene and oxygen to a distributing block serving the heating head, and no water quench of the head areas treated is required as mentioned previously, the quench being produced by the mass of the rail itself. Neither is it necessary to liquid-cool the heating assembly—a copper baffle plate spaced between the outside and inside tips dissipating most of the heat in this assembly.

The rate of production under this procedure of rail-end hardening is about one joint per minute. This includes the time required to move from joint to joint.

In the process, an initial hardness of from 340 to 380 Brinell is obtained, which extends to an average depth of about one-quarter inch below the running surface of the rail, but deeper on the gage side.

It is characteristic of this type of treatment that the zone of transition between the hardened zone and the underlying untreated metal is comparatively broad. This presents separation of the metal in this zone under repeated loads. Another important characteristic is that the hardness is obtained without the formation of martensite microstructures.

Two Procedures

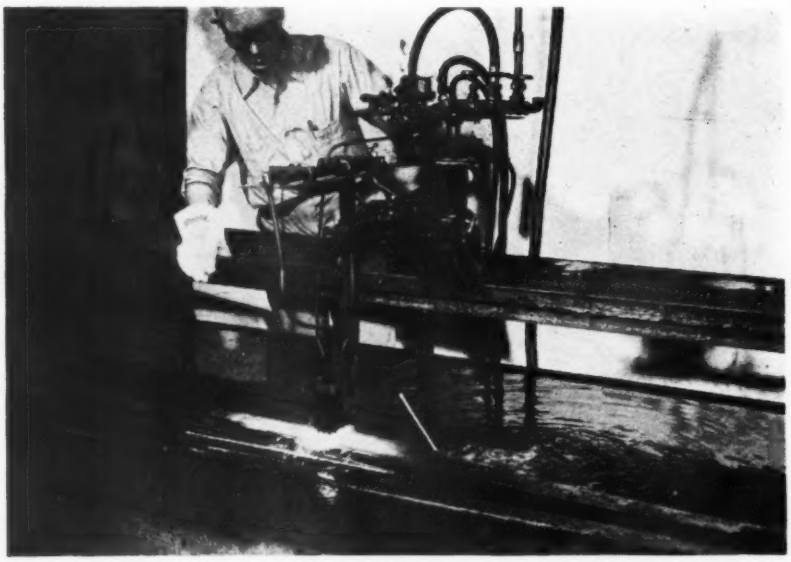
There are two general procedures followed in the machine end-hardening of rails in track. The first is to permit traffic to run over the untreated rail for a period of time, determined by the batter developed from the tonnage carried. This permits some cold-rolling of the running surface and allows the angle bars to become fully seated in the fishing areas of the rail. The rail is then surface-ground to equalize the height of abutting rail ends and the rail ends are doubled with a cross-grinder. Following this, the flame-hardening operation is carried out as described—this method providing a "tailor-made" flame-hardened rail end. The cost of end-hardening under this procedure runs from 40 to 60 cents per rail joint under present-day costs and traffic conditions.

The latest procedure in rail-end hardening is to treat the rail when it is laid by the rail gang. This results in considerable saving because additional flag protection is not required, and because it is not necessary to protect signal bonds against the oxyacetylene flame. Furthermore, the supervisor in charge of the rail gang also supervises the end-hardening operation. The beveling operation is also eliminated because rail received from the mill is usually beveled, and no correction is made for inequality in rail heights, since, on many roads, this refinement is not considered worth the additional expense. Following this second method of rail-end hardening in the field, the cost ranges from 25 to 35 cents per rail.

Flame-Hardening Frogs

There have also been important developments in the flame-hardening of open-hearth frogs. As in the case of hardening rail ends, the use of a water quench has been proved to be erratic in this case also, and an attempt to draw back the hardness after the water quench produced such varying results that this method was discarded. An attempt was then made to quench the treated area by conducting heat away through the base metal, however, it was evident at the outset that the relatively high heat input in progressive hardening would be greater than the rail, at ordinary atmospheric temperatures, could dissipate quickly. This factor was overcome by placing the frog in a water bath and keeping the water level to within one-quarter inch of its top surface.

The flame-hardening equipment used for this operation consists of a traveling carriage, which supports a special water-cooled heating head using 20 No. 56 D.S. oxyacetylene tips. In the heating process, only the area of the point and wing rails from the throat of the frog to the place where the wheels are entirely carried by the point, are treated. And the treatment resulting is similar to that produced in the heat treatment of rail ends, with a comparatively broad zone of transition between the hardened and unhardened metal, and without any formation of martensite microstruc-



Flame-Hardening an Open-Hearth Steel Frog Immersed in a Bath of Water of Which the Level Is Within ¼ In. of the Frog Surface

tures. Frogs treated in this manner wear evenly without warpage. The water tanks may be constructed of sheet iron, and should be large enough to accommodate the frogs. The water level is maintained by an adjustable drain pipe, with fresh water being introduced continuously.

Frogs treated by this process have given more than four times as much service as untreated frogs in the same location. The cost of treating a No. 10 100-lb. frog is about $7, including the cost of handling the frog to and from the tank. Since the underlying metal is unharmed, the frog can still be reclaimed by normal oxyacetylene welding after the treated area has become worn.

This same procedure is used to flame-harden other portions of the switch construction, such as the frog guard rails, special crossing frogs, and switch point stock rails. The cost of operation is so small compared with the resulting increased life that large sure reductions in maintenance expense are possible. In fact, few, if any, other maintenance expenditures will provide greater benefits than the flame-hardening of open-hearth track members.

Driver Burns—Hardening Frogs

(*Continued from page* 50)

is sometimes called "roaring track," due to the noise produced by passing trains. While the condition is not hazardous, it does affect the riding quality of the track and increases maintenance costs—besides being generally objectionable. Some railroads are equipped with grinding cars which are run over corrugated rail to grind off the high spots of the corrugations. This method is effective and satisfactory in removing corrugations, but only a few roads are equipped with these cars, and the cars themselves are quite expensive to operate. On the other hand, all roads are equipped with torches and have them readily available.

Recent investigations show that the high spots of corrugations, which are bright and hard, have a martensitic structure with a Brinell hardness in some cases as much as 600. In treating corrugated rail with a torch, the hard spots are heated to a drawing temperature of 700 or 800 deg. F. and allowed to cool. Following this treatment, the rail will soon wear smooth.

This process is under careful investigation by the American Railway Engineering Association and further information on it should be available in the near future.

Flame-Hardening Frogs

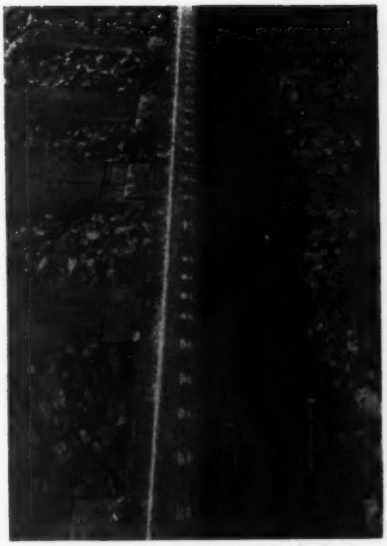
One of the outstanding recent developments in the application of the oxyacetylene process to track maintenance is the progressive hardening of the running surface of open-hearth steel frogs, whether in turnouts or crossings. It has been found that when flame hardened, these frogs will have a life equal to, or longer than, more expensive frogs.

All parts of the frogs or crossings which have been machined should be stress-relieved before being flame hardened. The rails are flame hardened before the unit is assembled.

The wing rails or frog points to be hardened are submerged, up to the ball of the rail, in a tank containing a soluble oil solution. A special heating and quenching tip is required for this operation. This tip, together with air dam and draw flame, is mounted on the arm of a radiagraph which is operated at a uniform speed. The sequence of operation is to heat, quench and draw. The soluble oil solution bath was found to be more satisfactory for a quenching agent than water.

One advantage of flame-hardened frogs lies in the fact that a hard wear-resisting surface is produced without affecting the ductility of the remaining portion of the steel.

[Other subjects discussed by Mr. Daley in his paper include the flame crowning or straightening of angle bars, the flame shortening of eye-bars in bridges to equalize stresses, the flame cropping of rails, and the flame cleaning of bridges and other steel structures.—Editor]



One of the Latest Applications of the Oxyacetylene Torch in Track Work Is the Tempering of the High or Hard Spots in Corrugated Rail After which the Corrugations Are Reported to Disappear. Shown Here Is a Typical Corrugated Rail

In This View the Wing Rail of an Open-Hearth Steel Frog Is Being Subjected to a Simultaneous Flame-Hardening and Tempering Process in a 10-Per Cent Solution of Soluble Oil and Water

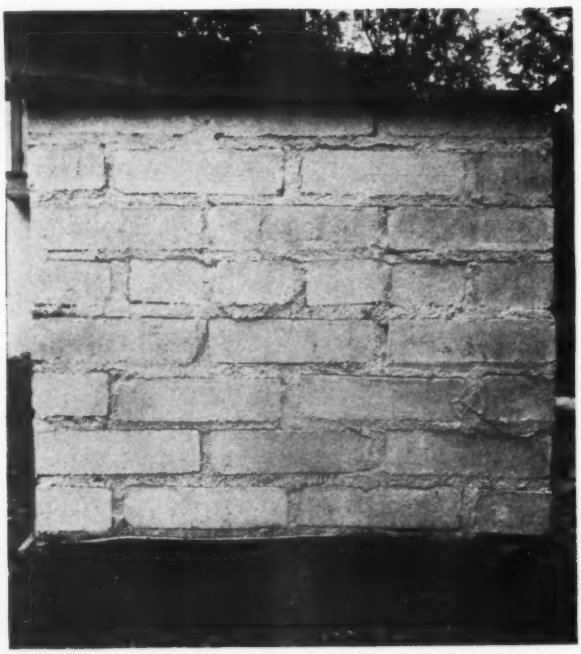
To determine the results to be expected from different types of coatings for masonry surfaces, and the most effective methods of application, the National Bureau of Standards conducted an exhaustive investigation during which specimens were observed over periods of three and six years. The coatings tested included cement-water, resin-emulsion, oil-base, and rubber-solution paints. This article describes the character of the tests and discusses the results that were obtained.

Tests Show Durability o

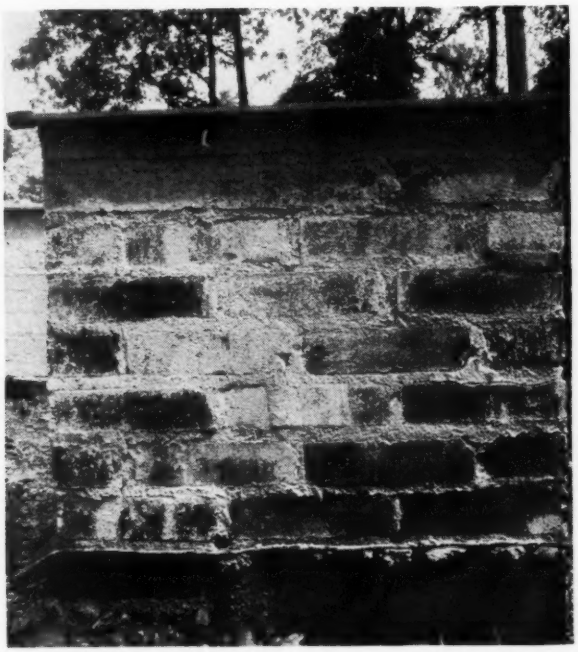
This Cinder-Block Test House Was Finished with Two Coats of Grout and Two Coats of Rubber-Base Paint. After Six Years It Showed No Evidence of Leakage from Rain or Melting Snow

THE extensive use of masonry building materials for which decorative or water-repellent treatment is desirable has increased the need for more complete information regarding the durability of coatings for masonry surfaces. Since cement-water, resin-emulsion, oil-base and rubber-solution paints are comparatively new the results to be expected from them are known only slightly to most users.

To obtain comprehensive data on the large number of paints in the masonry group, exposure tests were made by the National Bureau of Standards extending over periods of as much as six years. The medium for testing the paints consisted of several hundred unit walls, 2 ft. by 2 ft. by 8 in. in size, constructed of stone and cinder-concrete block, lightweight-aggregate block, new and used common brick, and cast-concrete slabs. In addition, the organic coatings—resin emulsion, oil-base and rubber-solution paints—we also applied to wood-frame walls covered with cement-asbestos shingles. The results of the tests are set forth in Technical Report No. 1115 of the National Bureau of



These Wall Specimens of New Common Brick Illustrate the Comparative Durability of a Good Rubber-Base Paint (Left) and a Poor Paint of the Same Type (Right), After Three Years of Weathering. To Obtain a Durable Coating for Used Common Brick, it Was Necessary to Apply a Coat of Grout to Even the Surface, Followed by a Rubber-Base-Paint and an Oil-Base Masonry Paint



ity of Masonry Coatings

Standards, from which the information given in this article was obtained.

In applying the cement-water paints they were scrubbed into the wall surfaces with stiff-bristle scrub or fender brushes, while the organic coatings were applied with regular four-inch paint brushes. Prior to painting, some of the walls were given base coats of grout, consisting of equal parts of white portland cement and mortar sand (passing No. 20 mesh sieve), mixed with sufficient water to give a creamy consistency. This base produced a hard continuous coating which improved the painting surface by filling the voids in the blocks and closing the openings in mortar joints.

The masonry wall specimens were exposed for a period of from three to six years, with those exposed for six years showing in general the same relative results as those for the three-year period. The results indicated that well-formulated masonry paints, skillfully applied, are durable and that it is possible to maintain painted masonry at minimum cost. The specimens, as painting surfaces, were rated in the following order: (1) new cement-asbestos shingle-faced walls, (2) stone-concrete block, (3) cinder-concrete block, (4) new common brick, (5) light-weight-aggregate concrete block, (6) cast concrete, and (7) used common brick.

For cement-water paints, the methods of application and curing, and the conditions under which the surfaces are painted, were found to be more important than the composition of the paint as long as the portland-cement content is not less than 65 per cent by weight. With the possible exception of cast concrete poured against oiled forms, cement-water paints are satisfactory for the initial painting of new masonry. Further coatings are not necessary although, for improved decorative value, the cement coating may be covered with an exterior masonry oil-base, resin-emulsion, or rubber-solution paint. A synthetic rubber paint can be applied after the cement-water paint dries, but it is recommended that two week's aging and three month's aging be allowed before application of resin-emulsion and oil-base paints, respectively. Sharp sand in cement-water paint adds to the durability of subsequent organic coatings on open-textured walls or those having cracks or other defects.

On close-textured or open-textured surfaces that have been moisture proofed, oil-base paints may be used but not until after 6 to 12 months following construction, at which time the walls must be dry. Also they must be so constructed as to remain dry after painting. When applied to a wet wall or one that becomes wet through structural defects these coatings are said to fail by scaling and flanking.

A grout of portland cement and sharp sand provides a good base coat on open-textured surfaces. A base of this type should be allowed to set a minimum of 90 days. A protective primer, such as rubber-solution paint, should be used as a first coat over the grout if there is a possibility that the wall will be damp or contain soluble salts. One coat of oil-base paint should give a good finish, although a second coat will have greater durability.

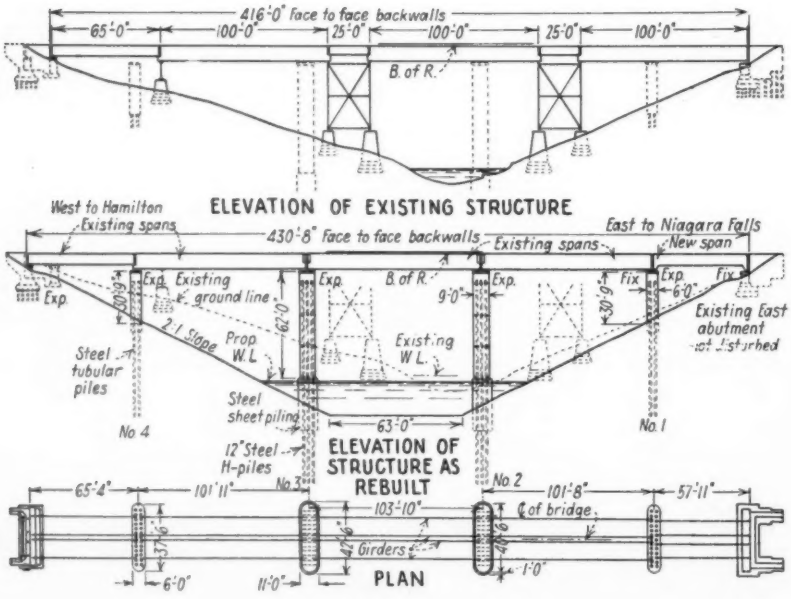
For resin-emulsion paints, which have good decorative qualities and are durable on exterior masonry walls, open-textured surfaces should be given a base coat of grout or cement-water paint containing sharp sand. A minimum of three weeks should elapse before painting new masonry walls. Resin-emulsion paints can be applied easily, by brushing or spraying to either damp or dry walls.

Comparative Results Obtained with Cinder-Block Wall Specimens Containing Iron Filings. The Specimen at the Left Was Protected with Two Coats of Rubber-Base Paint Applied Over One

Coat of Grout, While the One at the Right Was Covered with Two Coats of a Cement-Water Paint. Note the Iron-Rust Stains that Have Penetrated to the Surface in the Latter Specimen

These Bridge Piers on the C.N.R. Are Shafts of Steel

Above—The Slender Nature and Uniform Section of the New Piers Are Shown by This View. Below—Drawing Showing Essential Details of the Bridge Before and After It Was Reconstructed



A HIGHLY unusual bridge pier design, which proved to have important advantages, was used in the recent reconstruction of a double-track deck plate-girder main-line bridge on the Canadian National. In this design each pier is composed essentially of a group of steel piles, extending nearly the full height of the pier, which is enclosed within Prepakt concrete so that a monolithic pier shaft is formed. Because of the strength and lateral rigidity of this design a relatively slender pier of uniform section is permitted. By using this design for the piers the construction time and the cost of the work were substantially less than would have been the case had conventional methods been used.

Original Alinement Retained

Adding further to the interest attached to this project is the fact that an important additional saving in both cost and time was realized by reconstructing the bridge on its original alinement, with the substructure work being done entirely beneath the track level and without interfering with train movements over the bridge. In this connection the pier design chosen was the essential factor in expediting the work and enabling it to be executed on the existing alinement and in close proximity to the old piers without endangering the existing substructure even though they were founded at depths below the old footings.

The structure involved in this project is located on the double-track main line of the Canadian National between Hamilton, Ont., and Niagara Falls, where it crosses the valley of Twelve-Mile river which serves as the tailrace for a large hydro-electric power plant near St. Catharines, Ont. This valley is about 100 ft. deep. The old bridge was composed of six spans, each consisting of four lines of deck plate girders (two under each track), having a total length of 416 ft. Three of the spans were 100 ft. long, two were tower spans 25 ft. in length, and the sixth was a span 65 ft. long. The substructure consisted of masonry abutments, two steel towers and a steel bent, all carried on masonry pedestals.

The river which is spanned by this bridge serves as the tailrace for the DeCew hydro-electric generating plant which recently was enlarged to double the power output. This, in turn, involved the widening and deepening of the river to provide for three times as much tailrace capacity, with the resultant imperative requirement for a new bridge of greater length and much deeper foundations.

Old Spans Retained

The existing superstructure, which was originally erected and put into service in 1902, had been well maintained and was fully satisfactory in

Piles and Concrete

When it became necessary to reconstruct a double-track viaduct as a result of the deepening and widening of the channel beneath it, the Canadian National realized many advantages by using a pier design embodying groups of steel piles encased in Prepakt concrete. With this design the new piles could be built underneath the existing spans and in close proximity to the existing foundation; hence it was possible to reconstruct the bridge on the original alinement.

condition and load-carrying capacity to meet the present-day requirements of high-speed heavy traffic on the line in question. Consequently, it was economically desirable that the steel superstructure be continued in service, and the design adopted was therefore predicated on the continued employment of the existing spans. Specifically the re-use of the three 100-ft. spans and the 65-ft. span gave the new bridge its required total length of 430 ft. 8 in. between the faces of backwalls, with the addition only of one new 57-ft. span.

The substructural layout was planned in such a way that it was possible to provide for the required increase in the total length of the bridge by relocating only one of the abutments, the other being retained unchanged for the new bridge. A new west abutment was built and four intermediate piers were constructed, designated from east to west as Piers 1 to 4, so spaced as to be constructed closely adjacent to the existing substructures.

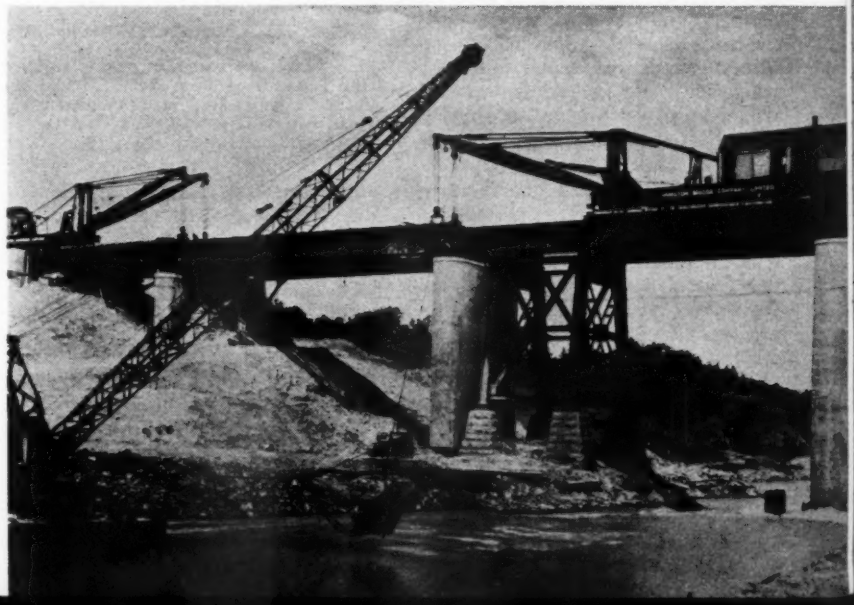
Location of Piers

The two highest of the four piers (2 and 3) of the reconstructed bridge are both situated within the confines of the enlarged river as required by the expansion of the hydro-electric plant. They are of the same height, each being approximately 64½ ft. high, measured from the new water level to the top of the bridge seat. The location of Pier No. 2 positioned it in the extremely fast tailrace water which existed in the original more confined course of the river; and Pier No. 3 is located directly adjacent to one of the old steel towers at a point where the existing ground was to be excavated to a considerable depth in deepening the channel of the river. In fact, at this location the new channel is considerably below the level of the footings of the masonry pedestals supporting the old steel tower. In spite of the adverse conditions existing at each of these pier locations, the type of pier adopted and the construction procedure employed enabled the work to be carried out expeditiously and relatively simply as will be described later.

Piers 2 and 3 are identical in design. Each of them embodies thirty-six 12-in. 65-lb. steel H-piles, arranged in three rows of 12 each. These piles were driven to rock and extended upward to the cut-off elevation, which was approximately 6 ft. below the finished bridge seat. That portion of each pier extending through the water and into firm material below the channel bed was enclosed in steel sheet-piling and filled with Prepakt concrete. From the top of the sheet-piling to the cut-off level of the steel piles, these piles were encased in Prepakt concrete in such a manner as to form a slender shaft of uniform section 9 ft. wide and 40 ft. 6 in. long, with rounded ends constructed on a 4-ft. 6-in. radius. Each shaft has a heavily-reinforced cap, also of Prepakt concrete, which forms the bridge seat.

Prepakt concrete is formed by first filling the forms with compacted coarse aggregate and then consolidating the whole mass with a special cement-sand-water-admix grout which is forced to fill all the voids in the aggregate mass under pressure by pumped intrusion. Compared with ordinary concrete, Prepakt concrete is reported to have a number of advantages such as substantially higher strength, particularly at later ages, assuming equal cement content; greater resistance to freezing and thawing; greatly reduced drying shrinkage; absolute bond; greater resistance to

Right—Pier 2 as It Appeared When All the H-Piles Had Been Carried to the Cut-Off Line. Below—Shifting the Existing Spans Into Position on the New Piers



cracking; and a higher degree of impermeability.

In constructing Pier No. 2, which, as already indicated, was located within the fast water of the existing river, the work involved six separate steps. The first of these consisted of driving steel sheet-piling in conformity with the designed perimeter of the underwater portion of the pier. This pier-base "form" was 11 ft. wide and 41½ ft. long and was driven about 15 ft. below the final grade line of the new channel. The sheet-piling was driven by a Northwest crawler crane equipped with swinging leads and a steam hammer. The second step involved the excavation of river-bed material from within the steel sheet-piling by means of an orange-peel bucket operated by the crawler crane.

Driving the Piles

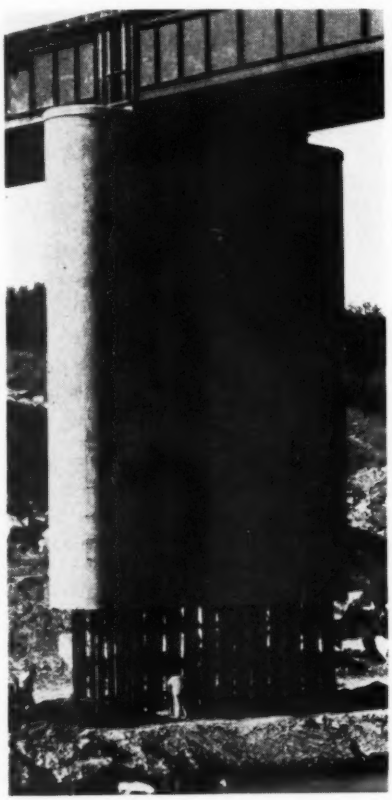
The third step in the construction of the pier was the driving of the H-piles by means of the crane and steam hammer. This work was done from underneath the bridge and the piles were spliced as necessary until driven to refusal with their upper ends above the normal water level. The average penetration below water level was 70 ft. In the fourth step additional lengths of H-piles were spliced by welding to those already driven, these lengths being such as to bring the piles up to the cut-off level. The piling forming the shaft of the pier was braced at intervals by welded steel angles.

In the fifth operation the steel sheet-piling pier-base "form," or cofferdam, was filled with coarse aggregate. The aggregate mass was then intruded with the special cement-sand-admix grout which, on account of its inherent immiscibility, forced the remaining water out as it rose within the "form," thus forming Prepakt concrete. Step No. 6 was to construct a conventional form around the steel H-piles up to the bridge-seat elevation, place the reinforcing rods for the pier-cap, fill the whole with coarse aggregate and intrude the mass to complete the Prepakt shaft of the pier.

Pier Built in "Reverse"

A unique feature in connection with the substructural work is the fact that Pier 3 had to be constructed in "reverse" as compared with usual practice. In other words the procedure in constructing this pier was to place the concrete for the upper portion of the pier shaft first and that for the lower portion, including the footing, last.

The procedure employed was dictated by the considerable depth to which this pier had to be carried below the existing ground level, and the further fact that the proximity of the footings for one of the existing steel towers would have imposed severe complications in carrying out the excavating work. Therefore, in constructing Pier 3 steel sheet-piling was first driven to a depth of about 15 ft. below the final grade line of the channel, after which the steel H-piles for the pier were driven to refusal, being spliced as necessary to bring them to the cut-off elevation. When this had been done and the angle bracing applied, a conventional form was constructed around the steel H-piling



Pier 3 as It Appeared After the Adjacent Old Tower Had Been Removed and the Channel Grading Had Been Completed. The Final Step Was to Place the Concrete for the Lower Part of the Pier

above the existing ground level and the Prepakt for the pier was placed above that level.

Further work on Pier 3 was then held in abeyance until the superstructure had been landed on the new substructure, removing the load from the steel tower adjacent to this pier. When this had been done the excavation of the existing ground around the lower portions of the steel H-piles was carried down to the proposed new water level. As this work proceeded, steel bracing was applied to the piles. When the material inside the cofferdam had been excavated to the desired depth the concreting of the footing and shaft of the pier was completed by bringing the concrete up from the foundation to meet that which had been previously placed in the upper half of the pier.

Piers 1 and 4

As steel H-piles were not readily available for Piers 1 and 4 which, being located higher up on the side slopes of the channel, are only about 31 ft. high above the ground, it was decided to use steel tubular piles, which were on hand, encasing them above the ground line with Prepakt concrete. These two piers are identical and in each of them there were placed 26 steel tubular piles, arranged in two rows of 13 each. Like Piers 2 and 3 they are topped by heavily-reinforced concrete caps 6 ft. in depth. The procedure involved in constructing these piers was similar to that employed for Piers 2 and 3 except that it was not necessary to drive steel sheet-piling for the footings.

As stated, the superstructure work consisted of shifting the existing 100-ft. spans and the 65-ft. span into position on the new substructures and installing the new 57-ft. span. In this work the superstructure for each track was handled by bridge derricks operating from the other track.

Substantial Saving

Employing the methods described in this article the work was accomplished at a cost of approximately $350,000, which compares with an estimated cost of $1,300,000 which would have been required if a new bridge had been constructed on a different alinement. Furthermore, only eight months were required to do the substructure work, whereas it is estimated that 2½ years would otherwise have been needed.

The type of pier used was devised by Charles P. Disney, consulting engineer, Toronto, Ont., who also originated the scheme for its application to the unusual circumstances and problems encountered on this project. The work was carried out under the general supervision of E. R. Logie, chief engineer, Central region, Canadian National, and under the direct supervision of K. Huffman, construction engineer of the Central region. The substructure work was performed under contract by C. A. Pitts & Co., in conjunction with the Prepakt Concrete Company, while all work involving the superstructure was carried out by the Hamilton Bridge Company.

Operating Motor Cars *Safely*

Part II

By G. R. WESTCOTT
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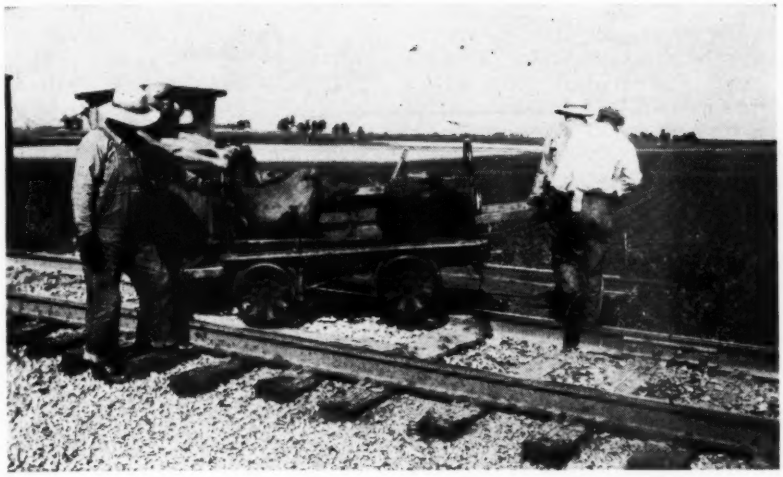
Missouri Pacific Lines
St. Louis, Mo.



Orderliness in Removing the Car From the Track Is Essential. Each Man Must Know What To Do and Do It

No. 17 of a Series

This installment completes the extended series of articles on motor cars that has been appearing periodically in *Railway Engineering and Maintenance* since March, 1945. In this series we feel that the author has done a remarkable job in drawing attention to and discussing all of the important factors surrounding motor cars, from their initial selection for various purposes, through maintenance and repair and their safe operation as discussed in this installment. Anyone who has followed the series carefully, whether operator, maintainer, repairman or supervisory officer, even if experienced, could not help but be benefited, and along with us is greatly indebted to the author for his painstaking care and effort to that end.—Editor.

THE best procedure in removing a car from the track has been described in a previous article of this series. The importance of handling the car in this manner is quite as essential to the safety of the men handling it as it is to the proper care of the car. Removing a car from the track, or replacing it, at a road crossing or a motor car set-off can be done much more easily and safely than on open track. Well designed and constructed set-offs should be provided at suitable intervals along the track. The set-off should have the space between the rails filled to within an inch or two of the top of the rail, and have a fairly smooth surface sufficiently firm to support the weight of the car. Outside the rail the hard surface should slope gently away from the track and should extend far enough from the track so that at least the wheels nearest the rail, when the car is in the clear, will be supported. Set-offs of loose ballast are not conducive to safety.

Removing the Car

When the removal of the car on open track is necessary, as may sometimes occur in the face of an approaching train, the training of the men so that each knows exactly what he is to do is of the utmost importance. The haphazard or misdirected efforts of untrained men may hinder rather than help the removal of the car, and may expose the men themselves to injury or death. It is better to have a few men working with understanding than to have a dozen men working at cross purposes.

Hold Practice Drills

The men who assist in handling the car should be so organized that each has a definite duty to perform each time the car is removed. Practice drills should be held frequently, both for the training of the men, and to satisfy the foreman that each man understands exactly what he is to do. Such drills should cover the removal of the car at a road crossing or set-off; but particularly on open track as it is there that an emergency removal is most likely to be necessary. In such a circumstance, of course, it is essential that the foreman indicate promptly to which side of the track the car will be removed.

In order that each man may reach as quickly as possible the position assigned to him for removing the car, he should be assigned a conveniently located seat on the car which he will always occupy.

No more men than can be seated comfortably should be permitted to ride on a car. Loose, makeshift, or otherwise insecure seats should not be used. No changing of seats, scuffling, or standing on a moving car should be permitted. These practices have resulted in serious and sometimes fatal injuries due to falling from a car. The men should be cautioned frequently that, if at any time it is necessary for them to jump from the moving car, they should choose the manner and place with as much care as the emergency will permit, and the speed of the car should be reduced as much as possible before they jump. Advice on what to do in such emergencies

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should be given to inexperienced men particularly.

Safety rails, foot guards, rail skids, and extension lifting handles on all cars, and set-off skids on small cars, mentioned in a previous article of this series, are all safety features that should be provided in order to minimize the danger of an accident.

Starting the Engine

The free-running engine on the modern car may be started by pushing the car along the track as was necessary with the now obsolete direct-connected car. The hazards of this operation will be avoided largely if, after the engine is started, the car is stopped while the men who pushed it get on. If this method of starting the engine is used, the men pushing the car should be warned to be on the lookout for open-deck trestles, skeletonized track, icy ground, turnout or other places where their footing may be insecure or obstructed.

The most common type of hand starter on both large and small motor car engines is the well-known starting crank. In using this, the handle of the crank should be given a quick quarter turn by pulling up against compression. Grasping the handle in this manner, and always pulling instead of pushing on the crank, will usually avoid injury, even though the engine backfires. Spinning the engine with the crank is a practice that is to be avoided.

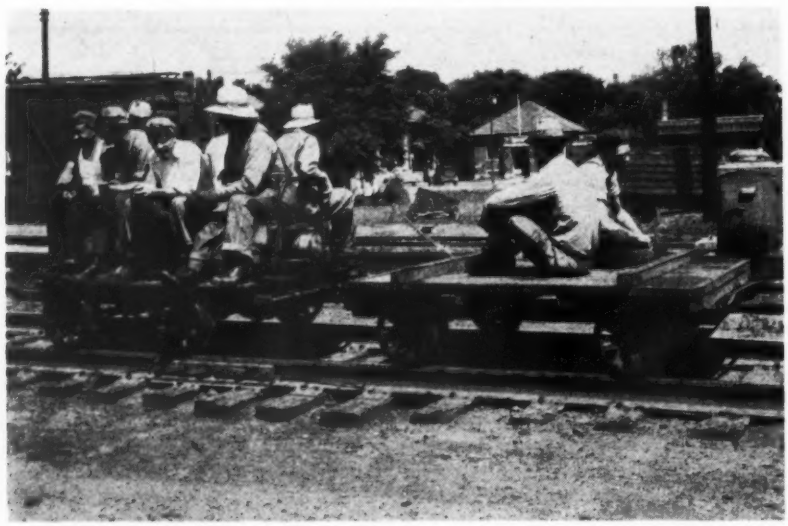
Some cars have an outboard bearing for the crank to prevent it from flying wild if it becomes disengaged from the crank shaft. If not so equipped, the crank should be a non-detachable type which, in use, must be pushed in against spring tension in order to engage the jaw on the end of the crank shaft. When this inward pressure is released, the crank is at once disengaged by the spring.

Rocking the flywheel against compression as a means of starting the engine is often forbidden by rule, and correctly so. On some cars the crank cannot be used when the seat deck is removed and the maintainer, in testing the engine, has no other way of starting it. In that situation the flywheel is readily accessible and, with care, there is little if any hazard in the method. When the seat deck is in place, however, the flywheel is hard to get at and the method cannot be used safely.

Retard the Spark

When starting an engine the spark should be retarded to avoid backfiring. Two-cycle engines have a hand lever for this purpose. On multiple-cylinder engines with distributor ignition, the spark may be retarded automatically, but if not, manual control of the spark should be provided. When magneto ignition is used, if the magneto does not have a manually-controlled spark, it should be equipped with an impulse coupling which automatically retards the spark at starting.

Electric starting equipment is coming more and more into general use on the larger motor car engines. It eliminates all the hazards of hand starting, but adds considerable to both first cost and cost of maintenance. Its weight is also objectionable on small cars.



What Is Wrong in This Picture? 1—No Brakes, Seats or Safety Rails on Push Car Used as Trailer; 2—Man Looking Back Is Too Far From Operator To Give Quick Notice of Danger From the Rear; 3—Operator of Car Not in Position To Brace Himself for Quick Application of the Brakes; 4—Man "Hugging" His Knees on the Push Car Is in an Unstable Position and Could Easily Lose His Balance

Use of Trailers

If the number of men in a gang is greater than can be seated with reasonable comfort and safety on a motor car, a trailer car for carrying additional men should be provided. Such a car should be well built and be equipped with safety rails, seats, and brakes. The practice of using old and badly worn push cars for this purpose, or of permitting men to ride on any car not properly equipped, is to be condemned from the standpoint of safety. The trailer car should be inspected as often, and maintained with the same care, as the motor car.

As on a motor car, the men riding on the trailer car should not be permitted to stand on the car, to sit where their legs overhang the end of the car, or to mount or dismount from the car, or change positions on it while it is in motion. A responsible man should be assigned to handle the brake on the trailer, and he must be on the alert at all times for signals from the operator of the motor car.

With trailer cars, the use of makeshift couplers, such as ropes, chains, or wire is even more objectionable than for towing push cars. With either push cars or trailers, couplers, as described in a previous article of this series, should be provided.

Gasoline

There is more hazard in the use and handling of gasoline than is realized generally. Accidents from this cause are not very common, but do occur; and when they do, are likely to result in much damage to property and, what is more important, in serious personal injuries. The use of open-flame lights where gasoline is used is hazardous, and smoking is likewise objectionable. Filling the fuel tank when the engine is running is especially dangerous, and should never be done. Workmen should avoid spilling gasoline on their clothes as the results might be very serious if it should become ignited.

The hazards in the use of gasoline are not limited, however, to the exposure of the fuel to possible ignition from external sources. The generation of static electricity within the gasoline itself should be understood by all, and precautions taken to prevent the ignition of the fuel from this cause. Static electricity is produced by the rubbing together of non-conducting substances. Gasoline is such a substance, and the agitation of it by stirring, by shaking the container or simply in flowing from the case, may develop an electric charge in the container. Chamois skin or felt strainers, or the flagman's flag are also non-

Above Left — Insecure Seats Are Not Safe. The Water Keg, on Which One Man Is Sitting Is Insecure. Above Right—No Chance of Spilling Gasoline Here: Note Safety Pump, Hose and Safe, Tight Can. Right—This Man's Interest in What He Is Trying to See Makes Him Forget That Standing on a Moving Car Is Unsafe. The Foreman Reminds Him

conductors, and should not be used for straining the fuel.

Especially if the earth is moist, a charge of static electricity generated in filling the can will usually be discharged harmlessly if the can is set on the ground momentarily before the fuel is poured into the engine tank. This fact should not be depended on for safety, however; to avoid the danger of ignition from a static electric spark, the filling funnel must make metal to metal contact with the engine and some metal part of the can should touch the funnel before and while the gasoline is flowing.

Paint Gasoline Cans Red

Gasoline cans should always be painted red to identify the inflammable character of their contents. Conversely, no other liquids than gasoline (or other inflammable fluids) should be put in red cans. Carrying an additional supply of fuel on the car is generally to be avoided. If required for any reason, the can should be painted red and tightly closed.

Another danger in the use of gasoline is that of carbon monoxide poisoning. Carbon monoxide is produced in the combustion of the fuel. It is a colorless, tasteless, and odorless gas, and can cause unexpected collapse, and finally death if breathed in quantity. For this reason, no gasoline engine should be operated in any closed building.

That "safety is of first importance in the discharge of duty," and that "obedience to the rules is essential to safety," are often found in rule books. Rule observance alone, however, is not all that is required; it is not possible to formulate rules that, under all possible circumstances, will indicate the safe course of action. The user of a motor car must always remember that there are possible hazards in its use, and that these hazards can be overcome only by constant attention to many details: paraphrasing a famous saying, "Eternal vigilance is the price of safety."

Rules—Safe Operation

(101) *Motor cars must be used only for railroad business. None but employees in the discharge of their duties shall be permitted to use or ride upon cars, except on proper authority.

(102) No one except a responsible employee who has qualified by passing such examinations as may be prescribed, who has a standard watch, and who has familiarized himself with the rules and instructions covering the use of motor cars, shall be permitted to operate a car on the main track.

(103) Inspect car daily before using to be sure that:

(a) Flagging equipment as prescribed by rule is on the car and in good condition;

(b) Car is equipped with safety rails, tool guards, and other safety devices in good shape.

(c) There are no worn, broken or loose parts that might cause an accident.

(104) Keep torpedoes, fusees, and flags on the car where they are instantly available for use.

(105) Make running test of brakes immediately after starting at the beginning of each run.

(106) Keep engine in gear, and apply brakes gradually when stopping. Do not permit wheels to stop turning, if possible to avoid, until car comes to full stop.

(107) Do not run faster than conditions of safety permit, and never exceed the maximum speed limits prescribed for the type of car being used.

(108) When running, do not:

(a) Stop closer than 200 ft. from a standing train;

(b) Run closer than 1,000 ft. behind a moving train;

(c) Run closer than 500 ft. behind another moving motor car.

(109) When running ahead of another motor car do not stop until you have given a signal and, if possible, until you have secured answer from the following car.

(110) On multiple tracks, if freight and passenger traffic are separated and operate in one direction only on each track, use the freight track and run with the traffic.

* The numbering of these rules is consecutive with previous rules included in this series, the last of which appeared in the installment on Efficient Operation of Motor Cars, in the July, 1947, issue, page 689.

(111) Approach highway crossings under control, giving highway traffic the right of way. Flag over crossing if highway traffic is heavy.

(112) Watch for obstructions on the rail, especially at highway crossings and where men are working.

(113) Watch for animals on or near the track that might be struck, derailing the car.

(114) Run motor car backward only when necessary, and then run slowly and turn the car at the first opportunity.

(115) If rules permit running backward, be sure car is equipped with tool guards on rear as well as on front.

(116) Be sure tool trays are tight so that tools or parts cannot drop through the bottom of the tray or through the engine housing.

(117) Load tools and materials with care to prevent their falling off.

(118) Assign seats to all members of the gang so that each man can reach quickly the position assigned to him for handling the car.

(119) Hold frequent drills in removing the car from the track so that each man knows exactly what he is to do.

(120) When emergency removal is to be made be sure that:

(a) Brake is released;
(b) Each man knows to which side of the track the car is to be removed.

(121) When removed from the track no part of the car should be closer than 6 ft. from the near rail.

(122) Do not permit men to stand on a moving car, nor to sit with legs overhanging end of car.

(123) Do not use any loose or insecure seats on the car. Each man should have a secure seat and have room to grasp the safety rail when necessary.

(124) Do not permit any scuffling or exchanging of seats when the car is in motion.

(125) Caution men not to jump from a moving car, except in extreme emergency. If necessary to jump, choose time and place with as much care as circumstances permit.

(126) Do not start engine by rocking flywheel against compression unless top and sides of seat deck have been removed from the car, and unless you know exactly how to proceed.

(127) In starting engine with a crank:

(a) Retard the spark;
(b) Grasp crank handle with fingers and thumb on the same side of the handle;
(c) Pull up against compression.

(128) Direct-connected cars must be started by pushing the car along the track. The men pushing should be warned to:

(a) Avoid insecure footing, such as open track, obstruction or icy spots;
(b) Mount car, when in motion, from the rear only.

(129) Cars with free-running engines may be started by pushing along the track with engine connected. After the engine is started the car should be stopped while the men who pushed get on.

(130) Trailer cars for handling men should be maintained with the same care as motor cars. They should be equipped with seats, safety rails, brakes and standard couplers.

(131) Trailer cars or push cars should be towed and never pushed by a motor car.

(132) Leaking gasoline tanks, lines or connections must be repaired at once.

(133) Do not use open lights or smoke while inspecting or repairing the car or filling the fuel tank.

(134) Do not fill fuel tank while engine is running.

(135) Avoid spilling gasoline on clothes.

(136) See that gasoline cans are painted red and are tightly closed. Do not put oil or other non-inflammable liquid in red cans.

(137) Avoid carrying extra gasoline on the car. If it must be done, be sure can is painted red and tightly closed.

(138) Avoid igniting gasoline by a spark from static electricity by:

(a) Touching the filling can to moist ground momentarily after it has been filled, shaken, or the contents stirred, before pouring the gasoline into the fuel tank.
(b) Making sure the funnel makes metal to metal contact with the engine.
(c) Making sure that the filling can makes metal to metal contact with the funnel before and while the fuel is being poured.
(d) Avoid the use of chamois or felt filters.

(139) Avoid carbon monoxide poisoning. Never run a gasoline engine in any building that is not well ventilated.

Deferred Maintenance Is $450,000,000, Says I.C.C. Bureau

DEFERRED maintenance has accumulated on the Class I railroads of the United States to the extent of $450,000,000, according to the results of a "maintenance study" prepared by the Engineering Section of the Bureau of Valuation, Interstate Commerce Commission, and made public in December by W. P. Bartel, secretary of the commission. Significantly, nearly all of this deferred maintenance is found to exist in the track accounts and is attributed to "priority controls and labor shortages in war and post-war periods."

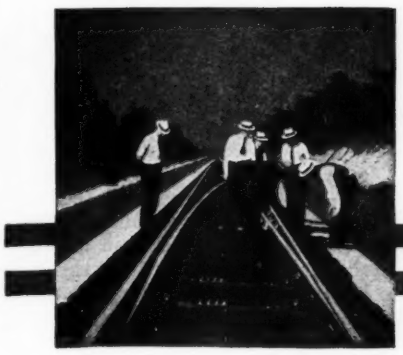
The commission has been making these maintenance studies annually for several years, but this is the first one to be made public. In releasing the study Mr. Bartel pointed out that the conclusions contained in it result "from these prior investigations, numerous discussions with carrier maintenance officials, and actual inspections over many thousand miles of railroad." The thought is expressed in the study that detail chart studies will more accurately determine deferred, surplus or normal maintenance than any other method, but that, due to limited personnel, a short-cut has been developed, based on the results of prior chart studies, which "we think will produce reasonably accurate estimates." The resulting estimates, giving accumulated deferred maintenance from 1942 to 1947, are adjusted to eliminate retirement and depreciation charges, to give consideration to the excess cost of overtime, to reflect a common dollar of equal purchasing power, and to give consideration to the effect on maintenance costs of increased or decreased traffic changes.

With one exception, accumulated deferred maintenance was found to exist only in the track accounts. These accounts and the amounts of deferred maintenance estimated for them are as follows: Ties, $114,171,000; Rail, $132,300,000; Other Track Material, $107,543,000; Ballast, $16,704,000; and Track Laying and Surfacing, $136,557,000. The excepted account was Superintendence, and the figure for this account is $10,247,000.

The total deferred maintenance as represented by the figures given in the foregoing paragraph amounts to $517,500,000. However, "because obsolescence in rail does not have to be made good" the amounts of deferred maintenance in rail and associated items were reduced by 20 per cent. When this was done the total figure for deferred maintenance was brought down to $437,879,000, with $450,000,000 being adopted as a round-number estimate.

The study pointed out that, since ties, rail and track materials are still not available in adequate quantities, there has been an increase in deferred maintenance in 1947 in the track accounts. Regarding rail, it was noted that the amount of deferred maintenance in this account actually represents about 2½ years normal installations when traffic volume is heavy. "Since the average life of new rail is less than 20 years, or about 20 years if we ignore obsolescence, it would follow, if our estimate is correct, that operating efficiency, if not impaired, is at least reaching the point where such efficiency is threatened."

With regard to Roadway Maintenance and Bridges, Trestles and Culverts a small amount of surplus maintenance was found, but it was concluded that the maintenance in these accounts had been normal.



What's the ANSWER?

Methods of Surfacing Sinks

Where soft spots or sinks in track require frequent surfacing, should they be tamped level with or above the adjacent stable track? Explain.

Raises Above Stable Track

By W. S. Broome
Assistant Chief Engineer, Colorado & Southern, Denver, Colo.

Soft spots or sinks which require frequent surfacing should always be tamped above the adjacent stable track. The amount that the soft spots should be raised above the level of the adjacent stable track will depend upon many factors, such as type of ballast, kind and speed of trains, weather conditions (wet or dry), whether the soft spot is under one rail or both, etc.

In general, soft spots should be tamped ¼ in. to 1 in. above the level of the adjacent stable track. Extreme care should be taken not to tamp any stable ties at the ends of the spots. The foreman should mark the last tie in each direction that he desires to have tamped, and then should watch his men closely to see that the tamping is stopped on those ties. Otherwise a high spot will be developed ultimately at these points. In dry weather, it is not necessary to raise the track as high above the regular level as in wet weather. When the soft spot is under one rail only, or when one rail settles more than the other, extreme care must be exercised in humping the track or a condition will be developed that will cause trains to swing.

I find that a good foreman soon learns how to treat each soft spot on his section. Usually the roadmaster knows the characteristics of the soft spots on his territory and is able to instruct new foremen in the correct way to handle each one separately so as to require the least maintenance at the particular location. I find that young, relatively inexperienced foremen have a tendency to raise the track too little instead of too much. This, of course, makes it necessary for them to return to that spot sooner or more often than necessary.

The best remedy for soft spots, of course, is to stabilize the track in some approved manner, thereby removing the necessity for the excess tamping.

Raise Main Tracks Level

By Malcolm E. Condon
Track Supervisor, Erie, Marion, Ohio

Soft spots or sinks should only be tamped level with the stable track adjacent. This applies to main tracks, or sidings where train speeds are in excess of 20 m.p.h. Theoretically, if the soft spot is normal to the track and settles uniformly across the track, the frequency of necessary resurfacing would be reduced by raising the track in a short vertical curve across the soft spot. However, this would not improve the riding qualities of the track.

Unfortunately, many of the soft spots encountered are far from uniform. At some, only one rail settles, while at others both rails sag, and one may sag lower than the other and over a greater length of track. Raising such track higher than the stable track each side of it might produce a dangerous cross-level condition. Too much would be left to the judgment of the individual foreman as to how high the track could be raised safely above the normal plane, and as to how far to carry the raise. By raising the track level, it may be necessary to do the work more frequently, but good surface and cross-level will result each time. Wherever possible, the condition causing the soft spot should be determined and, if economically feasible, corrective measures instituted.

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered In the March Issue

1. *What facilities should be provided for furnishing an adequate amount of light for emergency track work at night? Where should such facilities be stored? Why?*
2. *Under what conditions can cinder concrete be used in railway buildings? What are its advantages and disadvantages?*
3. *Should work-train crews be called upon to work overtime? Under what conditions? What considerations are involved?*
4. *How does one jet a pile? What type of pump should be used? What water pressure? What size nozzle?*
5. *When raising track, what rate of run off should be provided for the passage of trains? When closing the work for the day? What factors are involved?*
6. *What type of organization will give the most satisfactory results in handling repairs to pumps and other water-service equipment, in both the field and shop? Why?*
7. *Does the heat of weed burners damage treated crossties even though they do not become ignited? If so, can this be minimized or prevented? Explain.*
8. *What measures can be taken to prevent or minimize condensation and dripping from skylights? Does the design of the skylight or the type of glass used make any difference? Why?*

Where sags occur on tracks where the speed is 20 m.p.h. or lower, it is permissible to raise the track above the normal plane to reduce the frequency of resurfacing. Discretion must be exercised, however, in such cases as to how high and how long the raise should be. Care must be taken not to carry the additional raise back onto the stable sub-grade, or a condition will result in which the track will have a "corduroy" surface that will be worse than the original sag.

Higher Raises Beneficial

By C. E. Greenwalt
Section Foreman, Chicago & North Western, Owanka, S. D.

My experience with the type of track mentioned in this question has taught me that it is desirable to raise soft spots above the level of the adjacent stable track. The height to which the track should be raised, however, should be determined by the maximum speed of trains over the particular stretch of track, the rate of settlement of the track at the soft spot and the season of the year. The raise should not be high in the late fall months if there is danger that the track might freeze and heave later.

Where the maximum speed of trains is not over 60 m.p.h., track over soft spots can be raised above the adjacent stable track at least 75 per cent of the distance that the track has settled. In raising, the foreman should use extreme care not to tamp beyond the limits of the soft spot.

As a rule, there is a settlement of both rails over such sinks, with one rail sagging lower than the other. The rail on the weaker side should be raised correspondingly higher than the other.

Handling soft spots in this manner will result in two definite benefits: (1) The cost of maintaining the track will be lowered by reducing the number of times surfacing is necessary; and (2) the stability of the track will be increased because it is not necessary to disturb it as frequently as when it is raised level with the adjacent track.

Use Care at Ends of Spot

L. A. Rape
Section Foreman, Baltimore & Ohio, Evans City, Pa.

I think I am qualified to answer this question due to the fact that for eight years I worked a 7-mi. section of single track on which there were 52 sinks. My gang was sometimes as low as two men for over a year, and the speed limit was 50 m.p.h. Traffic over this section was mostly coal, was fairly heavy, and was hauled by heavy locomotives.

Some of these sinks were so active in wet weather that it was necessary to raise them daily for a week or more, and occasionally one had to be raised twice a day. On the other hand, some needed to be raised only once in a month in dry weather.

When they were settling rapidly I found it necessary to raise them above the adjacent grade because, if I did not, they would be too low before I could get back to them. The amoun that soft spots can be raised abov grade depends on the desired ridin quality of the track and on the soft ness of the roadbed or the speed o settling of the sink.

It is very important not to tamp single tie past the break in the road bed, for to do so might either buil a hump at the ends of the sink o cause the sink to grow in length. I the sink is quite soft, no harm wil be done if the first tie off the sink i left swinging an inch. However, eac sink is an individual problem to b studied and treated according to it particular peculiarities.

Air Conditioning Stations

To what extent is it practicable or desirable to air condition passenger stations or special areas within such stations? Are there special problems involved?

Needed in Humid Areas

By R. J. Gammie
Chief Engineer, Texas & Pacific, Dallas, Tex.

Numerous factors must be considered before air conditioning any passenger station. Special problems are always involved and are peculiar to or different for each station considered.

Some of these factors, not in the order of importance, are: (1) The size of the station; (2) the amount of passenger business; (3) the time between trains during which patrons may be occupying the station; (4) the geographical location; (5) the climatic conditions; (6) comparison of competitors' facilities; (7) whether new construction or improvement of old facilities is involved.

Air conditioning is expensive, not only in first cost, but also in maintenance and operation. It cannot be justified at locations where business is light and patrons few. It is not so necessary in arid sections of the country with only moderately high temperatures as in warm humid locations. At important stations it often approaches the category of a necessity because of the local situation and the prevalence of such in stallations in competitors' facilitie and in business establishments gen erally. Railroads have been back ward in the installation of this typ of improvement and it is reasonabl to expect that much more of it wil be undertaken in the future. It is messenger of good will and, as such cannot always be evaluated.

Already Proving Its Worth

By Supervisor Bridges & Buildings

As air conditioned passenge coaches, sleeping cars and diners ar becoming more universal, it is to b expected that the traveling publi will expect equal comfort provide at passenger stations.

It can be considered practicable however, only where local condition warrant its high original cost an expensive maintenance. Stations a southern locations, where the air i humid and hot for prolonged periods have been the first to be air con ditioned. Those chosen for the initia installations were in competitiv territory, at junction points when long waits between trains were matter of fact, not chance, and when the station was not so large as t make the cost of the air conditionin installation prohibitive.

The results have been so satisfac tory that other expenditures for suc services have been thought advis able. While the benefits are largel intangible, some have been notice able. A major advantage claimed b one railway officer is that air con ditioning has put pleasant, smilin

and agreeable ticket clerks behind their wickets in place of the wet-collared, grouchy individuals of previous years. He thinks that puts money in the till—not only at the time but in the future. Needless to say, he is enthusiastic about air-conditioned stations and anticipates that their number will grow.

It is conceivable that, as new small stations are being constructed to replace obsolete facilities—air conditioning can be designed for them in combination with their heating systems at only a slight increase in cost. Perhaps some of the coal burning railroads will use such methods to eliminate the dirt-nuisance as much as to offset the discomfort of humidity.

Reflectorized Switch Targets

Under what conditions is it practicable to use reflectorized switch targets or indicators at main track switches? What are their advantages and disadvantages?

Reflectors Are Practical

By L. L. Adams
Assistant Chief Engineer, Louisville & Nashville, Louisville, Ky.

It is practicable to use reflectorized switch targets or indicators at all main track switches where it is not necessary to do considerable switching at night. In such cases oil lamps should be used, as the reflectorized targets will not give any indication in back-up movements, or when cars are being pushed ahead of the engine.

The advantages in using reflectorized switch targets are (1) Dependability—oil lamps are liable to go out, whereas reflectorized targets will always function when beams from locomotive headlights strike them. (2) Wider angle of refraction on curves—a reflectorized target will show an indication before you could see an oil lamp from the engine. (3) Economy—the initial cost of reflectorized lights is much less than that of oil lamps and the maintenance is negligible, whereas, it would cost approximately $2 per month per light to maintain the oil lamps.

The only disadvantage of reflectorized switch targets is that they cannot be used where it is necessary to do night switching. In such cases oil lamps are the only indicators that will prove to be satisfactory and economical.

Unaffected by Weather

By W. O. Frame
Superintendent, Fort Worth & Denver City, Wichita Falls, Tex.

The use of reflectorized switch targets to replace oil-burning switch lamps is practical at main track switches on both principal main or branch lines having either single or multiple tracks. Exceptions must be made, however, at switches in yards and through station limits, which are regularly used by trains in picking up and setting out cars. This type of target gives a night indication only when the locomotive headlight is reflected from it. In switching it is a distinct advantage to the conductor or foreman in charge of such work to be able to see not only the position of the switches being used, but also of all other switches in the area of operations. Oil lamps indicate the position of switches other than those in which the headlight of the locomotive is shining.

The two principal advantages resulting from the use of reflectorized targets to replace oil-burning lamps are: (1) Reflectorized targets' functions are positive and are not subject to interference by weather conditions, except by occasionally being coated with sleet. Even then the interference is no greater than it is in the case of oil-burning lamps. (2) The use of reflectorized targets is far more economical and permits an annual saving in maintenance amounting to approximately $20 at each installation.

Stabilizing Embankment Slides

To what extent can grouting be used to stabilize sidehill or embankment slides? What special considerations or methods are involved?

Depends on Slide's Causes

By Ralph B. Peck
Research Professor of Soil Mechanics, University of Illinois, Urbana, Ill.

The most appropriate method for stabilizing any slope depends upon the causes of the movement or impending movement. The causes of loss of stability are extremely varied and depend to a great extent upon factors that cannot be evaluated without detailed study at each location. Among these are the nature of the materials in which the cut is made or of which the fill is made, the nature of the foundation material, the ground water conditions, the climate, and the manner in which construction was carried out. Therefore, this question cannot be given a single answer that will be applicable even to a majority of the conditions that may be encountered.

Grouting has been used with apparent success to stabilize fills consisting of loosely deposited soils. Many old fills were constructed without attempts to compact the soil. Such fills are still likely to contain numerous voids even if they consist of plastic clay. If water seeps into these voids from the pervious ballast, the strength of the clay decreases and the fill tends to become unstable. It is almost certain that grouting is beneficial in forcing the water out of the voids and filling them with grout. Fills that were constructed by dumping from trestles are commonly of very loose character. Inspection of some of these fills has indicated the presence of large and continuous voids that serve as distributing systems to carry water into the heart of the fill. Grouting can be used to fill these voids and undoubtedly increases the stability of the fill. The technique for introducing the grout is similar to that for grouting unstable track, except that points as long as 20 ft. have been used and injections are usually made starting at the bottom of the embankment and working toward the top. Generally, as much grout is injected as the fill will take.

Several sidehill slides have been grouted during the past two or three years. In some instances, the movement has decreased or stopped altogether. However, in treating such slides the action of the grout is not as easily understood as it is in loose fills, and the value of the method has yet to be fully established. Where the unstable section consists of fill resting upon sloping natural ground, water coming through the voids in the fill commonly seeps along the original ground surface. Grout near the base of the fill may reduce the permeability of the zone through which seepage

occurs and may even form a barrier that deflects part of the water from the surface of sliding. This appears to have been the case in some of the locations where grouting has been at least temporarily successful.

Grouting Is Economical

By A. W. Schroeder
Assistant to Engineer of Track, Chicago, Burlington & Quincy, Chicago

Great benefits have been obtained in stabilizing sidehill or embankment slides by the pressure grouting method. To obtain adequate treatment and lasting results it is necessary first to make a thorough investigation of the material in the fill. This is usually done by drilling. A 6-in. auger-type electric drill with current supplied by a motor-generator unit is a very efficient outfit for such exploratory work. By such soundings it is possible to locate the depth of clay and plot the clay planes. Slides usually occur over steeply inclined clay planes. The location and quantity of the various kinds of material in the fill and the presence of free water can also be determined.

After the data obtained by drilling has been plotted to show the cross section at each station drilled and a profile of the clay with respect to the top of tie, it is easy to determine the number, depth and location of penetrations that will have to be made with the grout injectors. Where penetrations are made in porous material, such as gravel or cinders, plans should be made to jet the points down with water under pressure. The jetting will not only increase the acceptance of grout but will also prevent early breakouts along the side of the points.

To stabilize a slide completely it is necessary not only to fill all voids and cleavage planes but also to seal off water entrances to the clay planes. While grout cannot be placed in a layer over the clay, enough can usually be introduced to increase friction sufficiently to overcome sliding. To accomplish this it is necessary to refer often to the drilling data so that the actual acceptance of grout at the location being treated can be compared with the theoretical acceptance of the material at that point. When the actual acceptance falls below the estimated amount, the method of treatment should be checked to see if enough penetrations are being made, if the material being treated requires jetting of the points, if breakouts are occurring as expected, and if the penetrations are deep enough. If all of these items check, it then will be necessary to thin the grout.

It is difficult to say just what procedure is the best in treating fills. Usually starting the treatment at the outside of the track, working to the shoulders and down the slopes of the fill, then returning and doing the center of the track last, is effective. By doing the center penetrations last, that part of the fill not reached by the side penetrations is sure to be treated and the center or core of the fill stabilized.

It is practically impossible to measure the effectiveness of treatment by the amount of grout introduced into the fill. More important is the element of placing the grout correctly. Each fill is different due to its own characteristics. Soil properties and the presence of porous material are probably the most important factors to consider. The mix ratio and amount of water per cubic foot of dry material may have to be changed in consideration of these factors.

Sidehills Not Yet Cured

By J. R. Rushmer
Roadway Engineer, Atchison, Topeka & Santa Fe, Amarillo, Tex.

Grouting has proved a very satisfactory solution to the sliding or sagging of embankments. In most such cases the cost of grouting has been reasonable, compared with the cost of day-to-day maintenance under conditions as they existed prior to grouting. Generally, there has been deep penetration of ballast into such fills, and sometimes there are extensive cracks in the embankment material. In some cases the natural ground beneath the fill is unstable. To secure good stabilization with safety against acceleration of the sliding condition, it has been found best to make the first injections of grout into natural ground outside the embankment toes, and to work gradually up the slopes of the fill with parallel lines of mud points, finishing up with injections in the normal positions, that is, just outside the end of the ties. Longer mud points than usual are advantageous in most cases. In some localities, large heaves have been formed in borrow pits, and there is occasional advantage in grouting such heaves.

Grouting of sidehill slides has not been as thoroughly explored as is desirable before stating any definite prospect of success. The method of treatment is also much more complicated than that for embankments. Sidehill slides usually involve strata in which water flows constantly or periodically, either or both lubricating or softening the material. Since it is difficult to survey fully all the factors in sidehill slides, results in the few cases of this kind that have been grouted to date have not been as uniformly successful as in the case of embankment grouting. It seems likely that to be successful in grouting sidehill slides, all water would have to be diverted from working through the roadbed. In those cases where this has been done the work has been entirely successful. In other cases, where water was not fully diverted, results were favorable but complete cures were not effected. No doubt further study will be made of such slides, and techniques perfected.

Grouting Is Effective

By Troy West
Engineer of Track, Union Railroad, East Pittsburgh, Pa.

The first problem to meet in attempting to prevent sidehill or embankment slides is to determine the cause of the trouble. By investigating the nature of the underlying materials in an embankment, the presence of free water and the slope of supporting rock can be determined. Both are factors contributing to the stability of the roadbed.

The cause of an embankment slide may be due to the kind of material used and/or the manner in which the fill was placed. Many railroad embankments, made 40 or 50 years ago, were often constructed of material taken from adjacent rock cuts, and the overburden, being removed first, was often placed on the bottom of the fill without grading or compaction. Embankments so constructed were probably adequate for the lighter loadings at the time, but for present-day heavier loadings, they may be unstable.

Where a railroad embankment has settled repeatedly over recent years, water pockets may have formed. In such cases, all surface water reaching the area disappears immediately into the ballast without any loss by evaporation or runoff. On meeting the clay line this water is churned in by the movement of trains, developing a fluid strata of material having a low bearing value. Bulges may appear on the slopes of the embankment as evidence of such action. This disturbance may extend into the embankment to a depth of 15 to 18 ft. It is possible to retard and control such action by drying up the mud seam by grouting.

An investigation by test borings can be made to determine the extent and nature of the displacement. With this information the depth of the grout points can be determined. Pneumatic-

type grouting equipment may be used, which can be made of equipment available on almost any railroad. The grout mixer could be a one-bag concrete mixer and the pressure tank of such size to accommodate the mixer. A compressor with a capacity of 105 cu. ft. per min. would be adequate for use in driving both bull and grout points and for injecting the grout. The grout points should be made of double-strength 1¼-in. iron pipe, cut preferable in 5-ft. lengths to facilitate driving a point which may be 15 ft. long.

That this method is effective has been proved by our experience in treating a sidehill embankment over which the track could not be maintained on alinement and grade due to continual settlement. Grout was injected by pressure into the embankment under approximately 400 ft. of track in November, 1943. Since that time the annual maintenance on this stretch of grouted roadbed has been no greater than on stable track.

Opportune Time to Dress Track

Should the track be dressed as heavy maintenance operations progress during the working season, or should this work be delayed until the late fall or winter months? What are the advantages or disadvantages of each practice?

Dress as Work Progresses

By C. G. Grove
Chief Engineer M. of W., Western Region, Pennsylvania, Chicago

There are four main reasons why the track should be dressed as the work progresses. They are: (1) The dressing may be done more economically as the work progresses before the ballast has settled into a compact mass. (2) If ballast is not dressed its contact with the rail and track fittings permits some of it to be ground up under the rail and the pulverizing, thus started, contributes to foul ballast. (3) Undressed ballast sometimes interferes with track circuits. (4) Work once started should be completed.

The appearance of an unfinished job has a psychological effect on men definitely tending to decrease their efficiency in everything that they do. Undressed track, with its accumulation of weeds over a period of time, gives the wrong impression to our patrons and tends to lower the morale of maintenance of way forces. Leaving track undressed contributes to poor housekeeping and lack of care in doing current work.

Daily Dressing Preferable

By J. R. Scofield
Assistant District Engineer, New York Central, Detroit, Mich.

Track should be dressed to standard cross section as soon as possible after it has been worked over and surfaced. To accomplish this ballast is spread ahead of the lifting gang where necessary for backfill. It pays big dividends in economy to see that this ballast is unloaded uniformly to save labor in equalizing it to form the standard ballast section.

Surplus ballast allowed to lie on the track for any length of time becomes compacted. The larger particles rise to the top due to vibration, and the benefit derived from uniform grading of the ballast material is lost. After several weeks of compaction, picks may be needed to loosen it so that it can be forked into place.

By dressing after each day's tamping, the work as a whole gives a better appearance and the foreman takes greater pride in the work as it is advanced. It has a good moral effect on the men, too. Furthermore, it teaches good housekeeping by keeping the roadbed clean and neat, and tends to abolish sloppiness.

I have found by trial that a gang of men will accomplish about as much tamping if the dressing is kept up each day. It adds variety to the work if the necessary dressing and other odd jobs pertaining to good maintenance are done daily. Any inequalities in line or surface of the track are more easily observed after it has been dressed. Immediate dressing thereby tends to accomplish better-riding track. Furthermore, good habits will prevail automatically and all the gang will sense the feeling of a job well done. The supervisor will spontaneously congratulate the foreman, who will pass it along to his men and thus stimulate further effort to do other jobs well.

If dressing is delayed too long, it may never be done. The supervisor, due to events beyond his control, may not want to spend several days or weeks to complete a dressing operation which will not show on the program chart.

Putting the job off until fall or winter means, in most cases, that it may never be done; and when it is done it will be more difficult to do it properly. Allowances are generally cut in the fall and there are other things which must be done to prepare for winter. Frozen ballast makes it very expensive to dress track in the winter. The job cannot be done right if it is put off too long and the benefits of uniformly placed ballast will not be obtained.

Surface and line will not hold if the dressing and equalizing of the ballast is delayed. Weak locations will soon show up, making early and costly spotting necessary. Such work is never as good as the original tamping.

Reduces Labor Turnover

By Supervisor of Track

While it may not be practical in all parts of the country to use year-round gangs, much can be done during the season of heavy maintenance in the way of planning work for the winter months. Dressing and equalizing ballast can be used as one of these off-season jobs.

Where ballast is not dressed and equalized immediately after surfacing, the work can be carried on with less men. Where this is done, backfilling should be confined to only enough ballast to hold line and surface. In signal territory, where ballast for dressing is unloaded after surfacing, it may be necessary to move part of the ballast to avoid interference with signal circuits. Where a Jordan flanger plow or a dapped tie is used for unloading, very little ballast is left in the track, and clearing it out is but a minor operation.

While there is usually some labor cut-back in the off season, equalizing and dressing ballast can be done with a smaller gang. Even though it may be impossible to hold and work the entire surfacing gang all winter, there would be an advantage in holding a small gang as a nucleus to start the next season's work. This and other work that can be done in the winter months will permit us to hire and hold a better class of labor than is possible where seasonal gangs are used.

The greatest disadvantage of leaving the equalizing and dressing of ballast until a later date is the rather untidy appearance it gives to the railroad. This, in my opinion, is offset by the saving of the money usually lost through labor turnover.

Glass in Windows and Skylights

What are the newer types of glass available for windows and skylights? To what extent are these adaptable to various types of railway buildings? Have they special advantages?

There Are Two New Types

By L. C. Winkelhaus
Architectural Engineer, Chicago & North Western, Chicago

For the past decade the trend in building construction has been for more and larger glazed openings. To satisfy this demand, glass manufacturers are offering several newer types of glass, among which are the heat-absorbing and insulating types.

Heat-absorbing glass has certain properties that absorb various percentages of solar heat, depending on the thickness of the glass. It also reduces the sun's glare and does not transmit as much light as ordinary glass. Such glass can be used to advantage in the windows and skylights of various types of shops, storehouses, and other similar buildings. This type of glass has a blue, or greenish tinge, and can be used for certain decorative purposes in passenger stations, such as in clerestory windows or skylights in trainshed roofs.

Insulating glass consists of two or more panes of glass separated by a ¼ or ½-in. air space, and hermetically sealed around the edges at the manufacturing plant. The use of this type of glass precludes the necessity for storm windows and reduces heat losses. Similarly, it assists in keeping a building cooler in summer. It also eliminates condensation (frost) on the glass, and therefore is quite useful in yard offices, interlocking towers, and other buildings where frosting of window panes is undesirable.

More Glass Will Be Used

By Assistant Architect

Several new types of glass, having found favor among designers of commercial buildings, are equally as serviceable in railroad structures. Most common among these are: (1) Heat-absorbing glass; (2) insulating glass; (3) corrugated wire glass; and (4) glass block.

Heat-absorbing glass is blue-green in color, and while admitting an adequate amount of light for many purposes, absorbs most of the sun's heat rays and effectively reduces glare and eye-strain. The available thicknesses of ⅛ in. and ¼ in. are adaptable for use in storehouses, shops and other buildings where a high degree of visibility to the outside is not required. It may also be used in special locations in conjunction with ordinary window glass.

Insulating glass units are made with at least two panes of glass separated by an air space ¼ in. or more in thickness. The air is dehydrated and the panes are hermetically sealed. This type of glazing provides clear vision, permits higher humidity with less condensation, reduces noise, lowers heating costs, and fills the needs of air-conditioned buildings. Already in use in interlocking towers and elevated yardmasters' offices, its use is spreading to other railroad buildings.

Corrugated wire glass is now being used for skylights, but is equally suited for decorative siding, canopies, and sawtooth-type roofs. It has been recommended for use as a fire stop in some instances.

Glass block can be used to replace glazed windows for the transmission of light into buildings. While utilized mostly in new construction as a functional decoration, it is also adaptable to modernization work or merely as replacement for decayed window frames, sills, etc.

Although glass has been used more and more by railroad architects in recent years, its use will undoubtedly continue to increase. Technological improvements are constantly being made that improve its structural strength and appearance. Announcement has just been made that phosphate glass has been manufactured without sand to add new fields of use for its unparalleled light-transmitting and heat-absorbing qualities.

•

Meaning of "Hungry" Water

What is meant by the term "hungry water"? What are the effects of using such water in steam or Diesel locomotives? Does it require further treatment?

Hungry Water Forms Scale

By G. E. Martin
Superintendent Water Service, Illinois Central, Chicago

The term "hungry water" is not in common use today, but when used, generally has reference to water of comparatively low hardness and low alkalinity, having a pH value of 7 or below. Distilled or de-ionized water is an example of "hungry water." In certain localities water with similar characteristics is found without treatment.

If this type of water is used in steam or Diesel locomotives without treatment, pitting or dissolving of ferrous metals with which the water makes contact will result. The higher the temperature encountered, the more rapidly the corrosion of the metal takes place. Low hardness waters, found in certain localities without treatment, generally contain some silica and enough calcium to bind the silica and result in the formation of a very hard crystalline scale on the flues and other portions of the boiler when used in steam locomotives without proper treatment.

Trouble from pitting when this type of water is used in steam locomotives can usually be overcome by adding soda ash or caustic soda to increase the pH of the feedwater to 9.5. As the feed water heats this concentration will rise to the requisite pH in the boiler water of 11 to 12. In certain instances further treatment of the water to remove oxygen is necessary to prevent pitting. When used for cooling water in a Diesel locomotive the pH should be increased to 9.5 and chromates added in sufficient amounts to have approximately 100 parts per million of chromates in the cooling water. When natural water of this type which contains silica is used in steam locomotives the silica should be removed by external treatment or phosphates added to the boiler water to prevent the formation of a silica calcium carbonate scale.

Means Corrosive Water

By Water Engineer

The term "hungry water" is loosely used to designate a corrosive or unbalanced water, as for example, one extremely low in dissolved solids.

Water is a universal solvent, and will dissolve more substances than any other known medium. When in a pure, or nearly pure, state, this characteristic is particularly evident, until its affinity for other materials, such as gases, liquids and solids has been satisfied—hence the term "hungry water."

Many natural waters usually found in some of the southern states may contain less than one grain of dissolved solids per gallon, yet the sulphates, low as they are, may predominate and upon concentration under heat and pressure in a boiler build up and cause serious corrosion. These waters, sometimes classified as borderline waters, or unstable waters, come within the category of the so-called "hungry waters." When such waters are introduced into the boilers of steam locomotives or the flash boilers or cooling systems of Diesel locomotives, severe corrosion is the natural result. Even with complete lime-soda ash treatment the sodium sulphate content may build up in the boiler to a point where corrosion may occur.

All such waters, whether for steam or Diesel locomotives, require some sort of finishing treatment. In the case of steam locomotives organic matter, usually in the form of tannins, has proved effective. However, the Diesel locomotives present a more difficult problem both in the question of flash boilers and cooling systems. Ordinary lime-soda treated water is not satisfactory. Demineralized or de-ionized waters appear to be the solution, but here again we find a "hungry water" and the necessity for an inhibitor to satisfy the affinity of the water for other substances which can only be the metals with which the water comes in contact. Therefore, a finishing treatment of some kind is required.

Bridge Inspection Photography

Should photographs be taken of bridge or bridge details during inspections? If so, what are the advantages of this practice?

Bridge Photos Very Useful

By Franz M. Misch
General Bridge and Building Supervisor, Southern Pacific, San Francisco, Cal.

Photographs of all bridges and major trestles should be on file in the general office of the railroad. These photographs should show the main details of the structure, such as piers, channel protection either for navigation or scour, a panorama of the entire bridge, and close-ups of track and deck construction. This photographic file should not represent one inspection but should preferably cover a period of many years. New photographs should be taken of any major renewals or repairs to bring the file up to date.

When a bridge department has built up these records it is not necessary for the bridge inspector to take record photographs of each bridge or trestle as inspected. He should take only the photographs needed to bring the file up to date.

Such photographic data is invaluable as a visual record available for any study at any time. The photographs can be used by draftsmen designing new details, by supervisors and engineers in studying design and maintenance problems, and by management in considering expenditures. Thus, this information should be of a general nature and not cover only structural defects or conditions which the inspector's notes on a current inspection.

The inspector should be provided with a suitable camera with which to take photographs of defects or conditions affecting the structure inspected. Photographs of fractured members, groups of rivet heads broken off, scour in steam-beds and other pertinent conditions will have greater weight in reporting these conditions than pages of inspection notes. In some cases these photographs will indicate methods to correct the defects which the inspector did not consider on the ground.

In some cases the inspector may have had a visual picture in mind at at the time of the inspection, but his written report may not have been complete. At a later date the visual picture may be lost, but a photograph, if available, will refresh his memory and save an unnecessary trip back to the bridge. These photographs of defects are then used in the office to design the correction. The draftsman or engineer will, no doubt, have plans of the structure, but a photograph will help him visualize the job conditions. Furthermore, the job photos, along with the design details, are valuable in presenting the matter to the management.

Progress photographs are another phase that should be considered in this discussion. Long typewritten job-progress reports, with percentage tabulations, and charts, become monotonous and do not always show the actual progress. Photographs of a job taken at regular intervals will save considerable time for all concerned.

The advantages of photographic records are many, but are difficult to sell until an inspector actually uses such a record as a part of his particular report. It is surprising the amount of written detail that can be eliminated by the inclusion of pertinent photographs. Too often I have seen an inspector wasting good paper or a table cloth trying to explain a point that a picture would have made simple.

Pictures Tell Stories

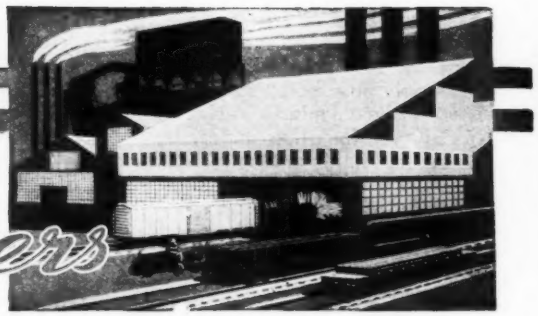
By Assistant Engineer of Bridges & Buildings

It has always been my belief that a picture of any railroad structure—bridge, station, water or coaling facility—is a valuable record in the office of the engineer responsible for the maintenance of these structures.

On bridge inspection trips, it has been our practice to take pictures of that portion of a structure requiring repair and budgeting the following year. Ready reference to these pictures assists greatly in determining which structural steel member should be repaired, which old stone arch should be lined, which bridge parapet and wings should be raised to hold roadbed properly, which timber backwall should be renewed, or where riprap should be placed to prevent further scour. To the regional maintenance officer responsible for the proper distribution of funds in maintaining three or four thousand structures such a dated picture record is invaluable.

To the office engineer and designing draftsman many details of an old structure are given in a picture that are not shown on any "as built" plan. Occasionally, a photograph will indicate to the designing engineer that a wing wall was not designed high enough or long enough, or that faulty design contributed to "that unsightly crack or leak." In short—each picture will tell a story.

PRODUCTS of Manufacturers



(For additional information on any of the products described in these columns, use postcards, page 35)

Water Treatment for Diesel Locomotives

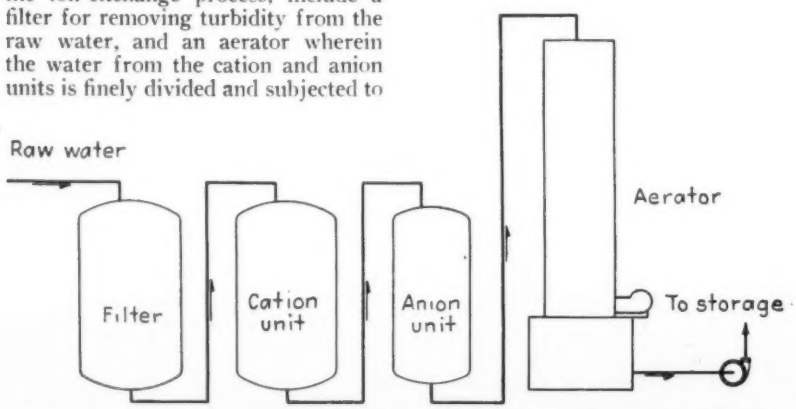
THE Worthington Pump & Machinery Corp., Harrison, N.J., is now offering a complete installation for the purification of water for use in steam generators on Diesel locomotives. This system, which is being marketed as the Worthington ion-exchange process, is said to remove objectionable dissolved impurities from water to a high degree.

A typical Worthington installation embodies two tanks of ion-exchangers, each being so arranged that water enters at the top, passes through a bed of an ion-exchange material and leaves through a system of underdrains beneath the bed. One of these tanks, known as the cation unit, contains a bed of exchange material which removes the ions of the base metals present in the water and replaces them with hydrogen ions to form mineral acids. This unit also neutralizes the alkalinity in the raw water, a process which is necessarily accompanied by the formation of carbon dioxide. The second tank, or anion unit, is known as the acid absorber and contains an exchange material which absorbs the mineral acids formed in the cation unit.

Other essential components of the system, but not directly involved in the ion-exchange process, include a filter for removing turbidity from the raw water, and an aerator wherein the water from the cation and anion units is finely divided and subjected to a forced draft of air for the purpose of removing the carbon dioxide formed in the cation unit. A fifth component of the system, not shown in the accompanying drawing, introduces a small amount of phosphate and alkilinity into the feed water to insure against possible hardness.

Water, in passing through the system, moves through the filter first and then passes into the cation unit, and through its bed of ion-exchange material. It then goes through the anion unit and its exchange material and, finally, into the aerator.

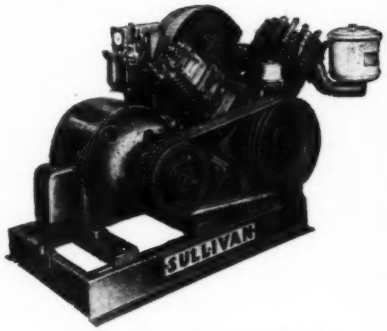
The ability of the ion-exchange material to give up useful ions in exchange for those that are undesirable becomes lessened as the water treatment contines until the material becomes exhausted. It must then be regenerated or restored to its original composition, and this is accomplished by passing a solution of the proper regenerative chemical through the ion-exchange bed in the reverse direction. In the case of the cation unit, the regenerative chemical is sulphuric acid, while in the anion unit it is sodium carbonate. The Worthington units are said to be constructed to facilitate this process. A feature of the Worthington ion-exchange system is the use of an alarm meter, known as the Worthington-Gamon alarm-meter for signaling the need of regeneration of the exchange material in each unit. Worthington ion-exchange systems are available for use in closed or open tanks, depending upon whether pressure or gravity flow is involved.



Flow Diagram of a Worthington Ion-Exchange System Where Filtration Is Necessary

"Unitair" Compressors

A NEW line of two-stage, air-cooled stationary compressors has been introduced by the Sullivan Division, Joy Manufacturing Company, Pittsburgh, Pa. Known as Unitair compressors, the units are available in nine sizes with power requirements ranging from 15 to 100 hp. and piston displacements from 81 to 590 cu. ft. per min. at a discharge pressure of 100 lb. per sq. in.



One of the Stationary "Unitair" Compressors

Three standard electric drives are available with these units, including built-in motor, direct-connected motor and V-belt drive. Also they may be equipped for use with gasoline or diesel engines.

These compressors have force-feed lubrication through oil passages by means of a positive gear-driven pump, a special type of oil cooling to reduce oil consumption, direct concentric valves, oversize ball-type main bearings, and four piston rings per piston mounted above the pin for greater economy in the use of oil and for a higher degree of air compression efficiency.

Fabco Tie Pads

FOR protecting the crossties in open track from tie-plate cutting and abrasion the Fabreeka Products Company, Boston, Mass., has introduced a tie pad of composition material for insertion between the tie plates and the ties, which is known as the Fabco tie pad. Already being tested under service conditions on a number of roads, this tie pad has been specially developed by the manufacturer for application on a large scale at nominal cost as an answer to the growing problem of mechanical damage to crossties in the tie-plate areas.

Fabco tie pads should not be confused with Fabreeka, a product manufactured by the same company, which has been in use for about 14 years at points of unusually severe service in track, such as under crossings and crossovers, on bridges and on turntables and at other locations where heavy impact shocks are encountered and where the pad material is used not only to reduce mechanical wear of ties but also the wear of manganese points and rail ends, and to absorb vibration and severe impacts.

The difference between the two products arises in the method of manufacture. Fabreeka is made of multiple layers of a specially-designed, hard-woven cotton duck thoroughly impregnated with rubber and cured under pressure and heat. The layers of duck are approximately 1/64 in. thick so that, for a pad 11/32 in. thick, there are 21 plys of duck. This construction is said to give Fabreeka unusual strength and certain outstanding qualities. For instance, the breakdown limit under compression of 21-ply Fabreeka is reported to be in the neighborhood of 14,000 lb. per sq. in.

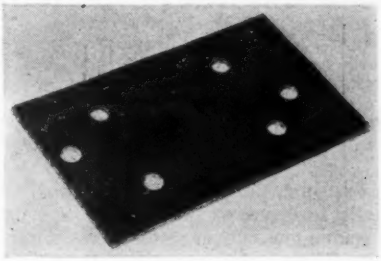
Fabco tie pads are also manufactured from cotton duck and rubber, but the material used consists of the trim of Fabreeka or similar types of material before it is cured under heat and pressure. This trim or scrap is ground up and then cured in molds under heat and pressure to the desired thickness and size. It is apparent, therefore, that the contents of Fabco tie pads are the same as Fabreeka, but that the structure, instead of being laminated, is a mixture. For this reason the breakdown limit of Fabco is about half that of Fabreeka but is still considered more than ample for service under tie plates. Fabco, moreover, is said to have the same resistance as Fabreeka to the elements and to withstand successfully extremes of temperature, as well as the effects of moisture, brine, mildew, sand, etc.

Fabco tie pads will be made in a single thickness, ¼ in., and will be available in various sizes to meet present-day A.R.E.A. standards for tie plates. The pads are now available in sizes of 7¾ in. by 12 in., 7¾ in. by 13 in., and 7¾ in. by 14 in., and other sizes can be made on special order. The pads will be punched for spikes to meet the requirements of individual roads. The spike holes will be round and will have a smaller area than the cross section of the spike. Since the Fabco material is resilient, a tight fit of the pad around the spikes will thus be assured, thereby helping to prevent the seepage of water under the pad and into the tie.

The cost of Fabco tie pads is appreciably lower than Fabreeka of similar size and thickness, and is considered sufficiently low by the manufacturer to warrant their application in open track on a large scale. It is expected that regular Fabreeka material will still be used at points of unusually severe service, such as those mentioned previously.

The material from which Fabco tie pads are manufactured has been under development for over seven years and has not only been exhaustively tested in the laboratory but also in the field. On the basis of these tests and experience with Fabreeka in track it is expected that Fabco tie pads will possess almost indefinite life in open track. In fact, it is expected that the new Fabco pads will have a service life as long or longer than that of the ties or the rail.

On the basis of the cost and the expected results the manufacturer is convinced that the use of Fabco tie pads presents a more economical solution to the problem of mechanical wear of ties than the use of larger tie plates without pads, and that, at the same time, such use would be in line with the necessity of conserving steel for other use.



Right—The Fabco Tie Pad Is a Mixture of Cotton Duck and Rubber, Cured in Molds Under Heat and Pressure. Above—An Installation of Fabco Tie Pads Applied Under the Tie Plates on New Pine Crossties

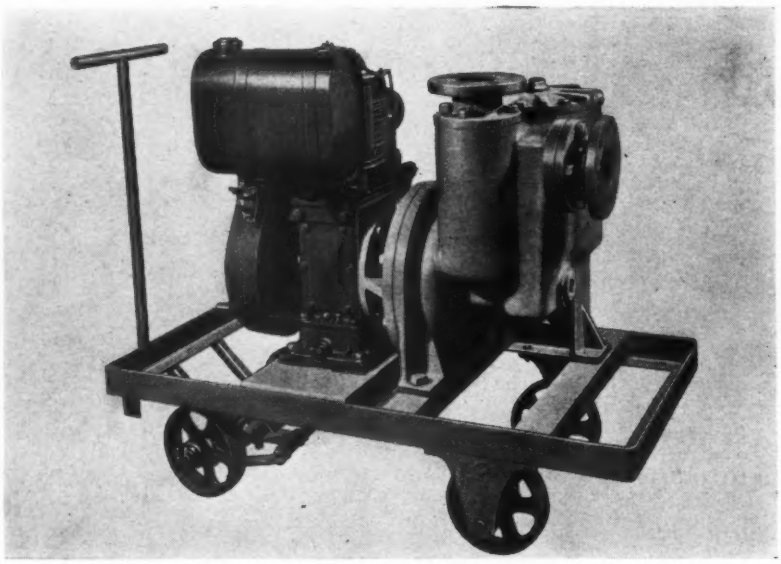
Self-Priming Pump

THE Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has announced the development of an automatic centrifugal, self-priming pump, designated as Type A, which is equipped with a new-type automatic spring valve, said to give faster, smoother transition from priming to straight centrifugal action.

The pump is started with the priming chamber filled with the liquid to be pumped, which is recirculated through the impeller. This action causes air from the intake line to be drawn into the "eye" of the impeller along with the priming liquid, the air being expelled through the discharge line. This recirculating action continues until all of the air is removed. The vacuum thus created raises the liquid in the intake line and closes the line.

The automatic priming valve then closes to end the priming cycle and the priming chamber becomes merely a part of the discharge line. The priming valve is said to function with precision-like accuracy to assure quick, smooth priming and rapid changeover to running action. If air should enter the suction line and the pump loses

(For additional information on any of the products described on this page, use postcards, page 35)



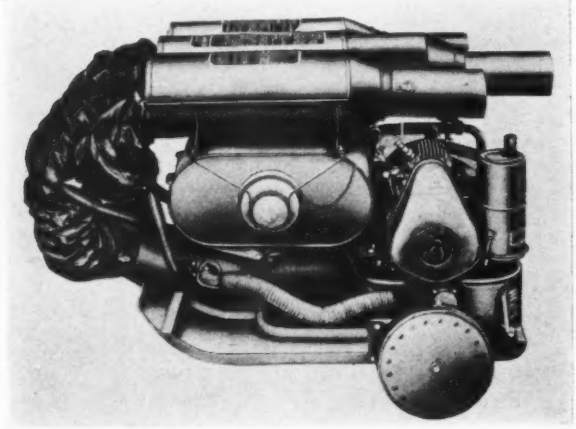
A 3-In. by 3-In. Allis-Chalmers Self-Priming Pump, Driven by a Gasoline Engine and Mounted on a Four-Wheel Truck

its prime, the valve moves automatically to the open position to start the priming cycle over again. This primer is effective for suction lifts up to 25 ft.

The self-priming pump is said to have many applications, including the loading and unloading of gasoline, fuel oil and similar liquids from tank cars, barges and storage tanks. Adaptable for use with gasoline-engine, motor, or steam-turbine drive, the pump can be direct-connected, close-coupled or belt-driven. Pumps of this type are available in sizes capable of pumping 90 to 550 gal. per min. Mechanical features of the pump include a self-cleaning, ¼-in. mesh screen to prevent the automatic valve from being joined by foreign matter, an open or an enclosed-type impeller, as desired, and mechanical shaft seals. The pumps have only 10 major parts, all of which are readily accessible.

Portable Heater

A PORTABLE gasoline heating plant, said to be capable of producing 100,000 B.t.u. per hour on 1¼ gal. of gasoline, is now being offered by the Ennis Supply Company, Minneapolis, Minn. This unit, originally developed by the Stewart-Warner Corporation for military and naval use in arctic regions, is reported to have many uses in the railway field.



The Ennis Supply Company's Portable Gasoline Heater

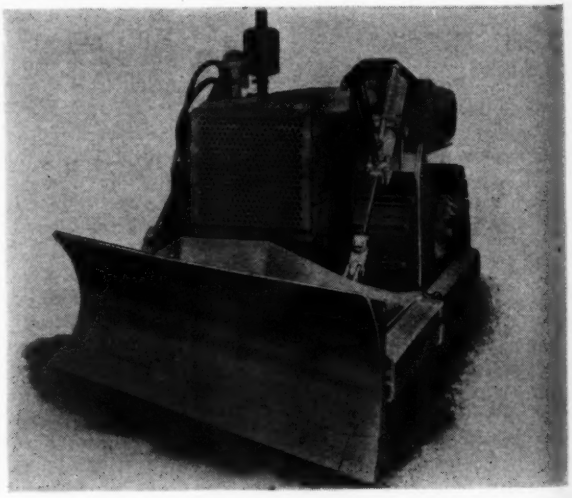
One of the heaters weighs 250 lb., and each of them is mounted on a pair of retractable wheels for towing over the ground. When mud, snow and ice are encountered, the wheels may be retracted and the unit pulled along on a sled bottom which comprises its base. The unit is equipped with three flexible heat ducts, two of which are 10 ft. long, while the other is 16 ft. long. The ducts may be hung up or put on the ground at desired points so as to direct heat where it is needed. It is reported that only 30 sec. are required to deliver substantial quantities of heat.

The unit is recommended for heating shelters, warehouses, freight cars, temporary quarters, such as construction office sheds, and for drying painted and plastered walls in new construction. Other uses include the thawing out of pipe lines, the thawing of truck, tractor and automobile engines on frigid days, thawing out frozen residue in cattle cars and thawing materials in hopper cars.

"Power Plus" Hydraulic Bulldozer

NEWLY-designed, hydraulically-operated bulldozers of both the straight type and the angle type are being introduced by the Wm. Bros Boiler & Manufacturing Co., Minneapolis, Minn. The new bulldozers are the outgrowth of improvements made to the line of dozers formerly manufactured by the La Plant-Choate Manufacturing Company, which has ceased to manufacture this equipment.

Designed for use with Caterpillar D4 and D6 crawler-type tractors, the new bulldozers incorporate the "fluid-power control" provided by the La Plant-Choate hydraulic pump, and are known as the Power-Plus dozers. The new dozer blades each incorporate a floating moldboard on a rigid frame, which is said to provide great strength; offset pivot pin for clear-



"Power Plus" Angle Dozer Mounted on a Caterpillar D4 Tractor

(*For additional information on any of the products described on this page, use postcards, page* 35)

ance; easy removal of main frame and blade; reversible cutting edge; and correct and proved blade curvature. In addition, the bulldozer is mounted without the use of a superstructure to obstruct the operator's vision. The straight models are of a new fan-tail box construction, which is said to eliminate multiple-welded pieces previously used.

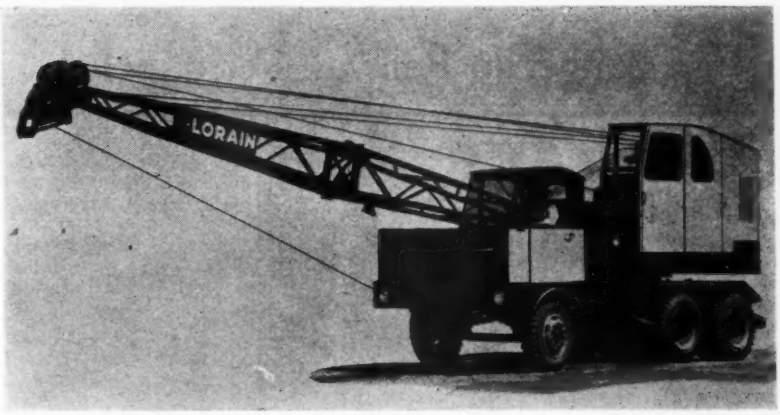
The hydraulic cylinders are supported on straddle-mounted brackets. This is said to assure centering of the lifting power and equal distribution of all working forces, thereby reducing side twisting and providing a more positive control of the blade with greater digging force. The hydraulic cylinders are of the full-floating assembly type, which is said to permit free movement in all directions and to tend to eliminate bending of the piston rods, piston cramping or scoring and undue wear on piston rings and wall.

Moto-Cranes Have Dual Control

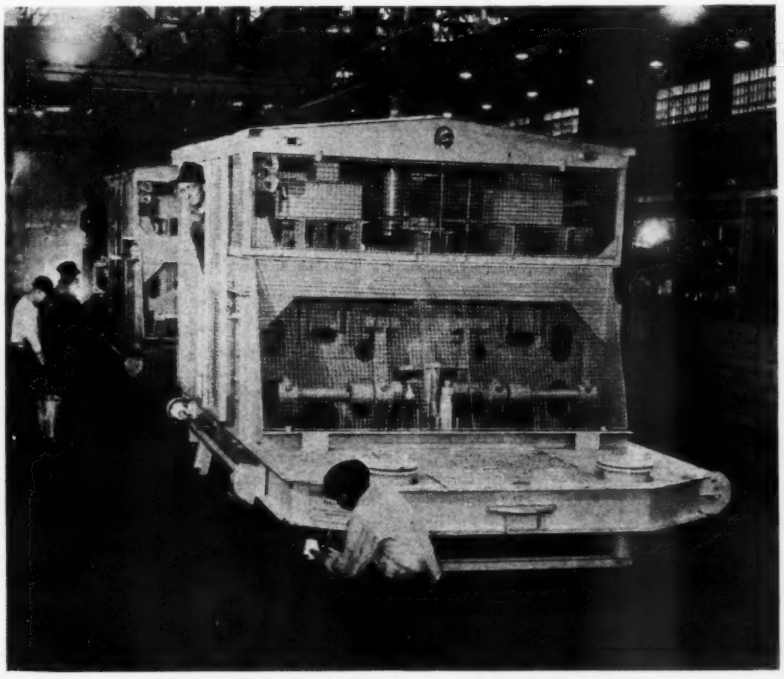
THE Thew Shovel Company, Lorain, Ohio, has announced Dual control, a feature which permits on-the-job travel of Lorain Moto-Cranes at speeds up to 7 m.p.h. to be controlled from the crane operator's cab. This feature, which is said to impart to Moto-Cranes the on-the-job advantages of self-propelled equipment, may be installed on any Lorain Model TL-20 crane mounted on standard 4-by-4, 6-by-4, or 6-by-6 rubber-tired Moto-Crane carriers.

It is reported that only five minutes are required to convert a machine that is equipped with Dual control into a self-propelled unit, in which on-the-job travel, powered by the turntable engine, as well as steering, controlled by air power, may be governed by the operator from his position in the turntable cab.

As already mentioned, travel speeds of 1 to 7 m.p.h are available when the crane is arranged for on-the-job travel. When the work at one place has been completed, and it is desired to move the unit to another location as a highway truck crane, the unit may be quickly reconverted to driver control in approximately five minutes. Over-the-road travel to the new location may then be done at speeds ranging up to 33 m.p.h.



One of the Lorain TL-20 Moto-Cranes for Which Dual Control Has Been Developed



Left—Two Power Track Ballasters Coming off the Assembly Line at the Hammond (Ind.) Plant of the Pullman-Standard Manufacturing Company

Below—The Tamping Shoes at One Side of a Power Ballaster Immediately After They Had Been Dropped Into the Ballast in the Tamping Operation

Pullman-Standard Producing Power Ballaster

THE Pullman-Standard Manufacturing Company has announced that the Power Track Ballaster is now being manufactured by its Power Ballaster Division, at Hammond, Ind. This machine, formerly manufactured by the Power Ballaster Company, operates on the track and tamps the ties my means of 32 tamping shoes attached to a crosshead which is alternately raised and dropped.

(For additional information on any of the products described on this page use postcards, page 35)

Changes in Railway Personnel

General

W. S. Sloatman, assistant superintendent on the Reading at Reading, Pa., and an engineer by training and experience, has been promoted to superintendent, with headquarters at Tamaqua, Pa.

W. S. Kerr, assistant superintendent on the Chicago, Burlintgon & Quincy at La Crosse, Wis., and an engineer by training and experience, has been promoted to assistant to general manager, with headquarters at Chicago.

George R. P. Graham, assistant superintendent on the Canadian National at Port Arthur, Ont., and formerly a roadmaster on that road, has been promoted to superintendent, with the same headquarters.

Lawrence S. Jeffords, general manager of the Atlantic Coast Line, and formerly chief engineer, has been elected also vice-president in charge of operations, with headquarters as before at Wilmington, N.C. A sketch and photograph of Mr. Jeffords appeared in the May, 1947, issue at the time of his appointment as general manager.

George W. Hand, assistant to the president of the Chicago & North Western System at Chicago, and formerly valuation engineer of this company, has retired, effective January 1. Mr. Hand was born on December 11, 1882, at Huntertown, Ind., and received his higher education at Purdue University and the John Marshall Law School. He joined the North Western in 1903, and subsequently held various positions in the road's engineering department until 1914, when he was appointed valuation engineer. He served as corporation engineer from 1918 to 1920, during the period of federal control of the railroads by the U.S. Railroad Administration. He was promoted to assistant to the president in 1920 and also to the same position on the Chicago, St. Paul, Minneapolis & Omaha (part of the North Western System) in 1926. Mr. Hand has served as vice-president of the Superior Coal Company since 1929 and as vice-president of the Interstate Transit Lines since 1932.

Engineering

John E. Gault, assistant chief engineer of the Chicago, Indianapolis & Louisville, with headquarters at Lafayette, Ind., has resigned.

P. T. Simons, assistant engineer on the Missouri Pacific, with headquarters at St. Louis, Mo., has retired after 30 years' service with that railroad.

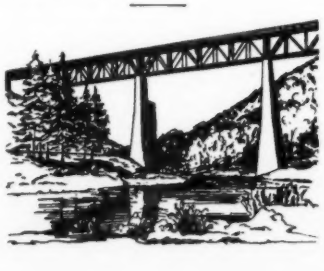
W. P. Hale has been appointed division engineer of the Oklahoma division of the Chicago, Rock Island & Pacific, with headquarters at El Reno, Okla., to succeed **Charles H. Gaylord,** whose death is noted elsewhere in these columns.

J. R. Scofield, division engineer on the New York Central at Chicago, has been appointed assistant district engineer of

J. R. Scofield

the Michigan Central, with headquarters at Detroit, Mich., succeeding **W. H. Miesse,** who has been promoted to district engineer with the same headquarters, to succeed **W. O. Houston,** who has retired, effective January 1. **J. F. McCook,** division engineer at Detroit, has been transferred to Chicago, succeeding Mr. Scofield. **J. W. Westwood,** assistant division engineer on the Michigan Central at Bay City, Mich., has been promoted to division engineer at Detroit succeeding Mr. McCook, and **J. D. Fraser,** supervisor of bridges and buildings at Detroit, has been appointed assistant division engineer at Bay City.

Mr. Scofield was born at London, Ohio, on May 6, 1893, and was graduated from Ohio State university in 1916. He entered railway service on April 19, 1920, with the Toledo & Ohio Central (part of the New York Central System) in the division engineer's office at Bucyrus, Ohio, subsequently serving as track foreman and track supervisor until 1926 when he was promoted to assistant engineer of construction at Bucyrus. In 1931 Mr. Scofield became track supervisor at Columbus, Ohio, and on April 1, 1942, he was advanced to assistant engineer in the district engineer's office at Cleveland. On May 1, 1943, he was promoted to division engineer at Mattoon, Ill., and in November of that year was transferred to Chicago where he served as division engineer until his recent promotion.

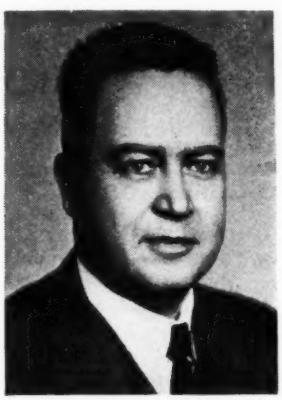


J. G. Gilley, division engineer on the Chesapeake & Ohio, with headquarters at Richmond, Va., has been promoted to engineer of track, with headquarters as before at Richmond.

G. W. Deblin has been appointed assistant division engineer on the New York Central, with headquarters at Columbus, Ohio, succeeding **K. E. Dunn,** who has been transferred to Erie, Pa., to succeed **C. A. Geiger,** transferred.

W. R. Luhn, assistant engineer in the valuation department of the Missouri Pacific, has been transferred to the maintenance of way department, succeeding **D. X. Greenberg,** whose death was reported in the November issue. **R. V. Hazer** has been appointed assistant engineer to succeed Mr. Luhn.

Theodore M. von Sprecken, chief engineer maintenance of way and structures of the Eastern lines of the Southern, with



Theodore M. von Sprecken

headquarters at Charlotte, N.C., has been appointed assistant to the chief engineer (system) at Washington, D.C. **Robert F. Logan,** superintendent at Atlanta, Ga., has been promoted to chief engineer maintenance of way and structures of the Central lines, at Knoxville, Tenn., succeeding **Edgar Bennett,** who has been transferred to Charlotte to succeed Mr. von Sprecken.

Mr. von Sprecken was born at Augusta, Ga., on August 7, 1893, and was graduated from the University of Georgia with a degree of Bachelor of Science in Civil Engineering in 1914. He entered railroad service that year as levelman with the Southern, during main line construction in Virginia and North Carolina, serving later as transitman and masonry inspector until 1917. During 1918 he was a second lieutenant in the U.S. Army Air Service. From 1919 to 1928, Mr. von Sprecken served successively as draftsman, designer and assistant engineer in the construction and maintenance departments of the Southern. From 1928 to 1931 he was resident structural engineer in the construction department of the Cincinnati, New Orleans & Texas Pacific at Lexington, Ky., then becoming assistant engineer in the office of the chief engineer of the Southern at Washington, D.C. In 1937 he was appointed assistant bridge and building supervisor of the Alabama Great Southern at Birmingham, Ala., and the

following year he became bridge and building supervisor of the C. N. O. & T. P. at Somerset, Ky. From 1939 to 1946, Mr. von Sprecken was engineer of bridges of the Western lines of the Southern at Cincinnati, Ohio, and on February 1, 1946,

Robert F. Logan

he became chief engineer maintenance of way and structures of the Eastern lines at Charlotte, N.C., which position he held at the time of his recent appointment as assistant to the chief engineer (system) at Washington.

Mr. Logan was born at Yadkinville, N.C., on March 13, 1904, and was graduated from the University of North Carolina in 1927 with a degree of Bachelor of Science in Civil Engineering. He entered the service of the Southern in 1925 as a student engineer at Danville, Va., and in 1927 was made rodman at that point. In 1929 he was advanced to assistant track supervisor at Gainesville, Ga., and later served as track supervisor at Keysville, Va., and Manassas. From 1935 until 1941 Mr. Logan served successively as assistant trainmaster and trainmaster at various locations. In May, 1941, he was promoted to superintendent, with headquarters at Richmond, Va., later serving in that capacity at Hattiesburg, Miss., and Atlanta, Ga., until his recent appointment as chief engineer maintenance of way and structures.

G. L. Field, division engineer on the Capreol division of the Canadian National, with headquarters at Capreol, Ont., has been transferred to the St. Lawrence division, with headquarters at Montreal, Que., to succeed **D. M. Trotter,** whose promotion to assistant superintendent was reported in the December issue.

Harry Posner, assistant engineer of structures on the New York Central at New York, has been promoted to engineer of structures, with the same headquarters, succeeding **Harry T. Welty,** whose retirement was reported in the December issue. **J. L. Beckel,** special engineer, has been appointed assistant engineer of structures to succeed Mr. Posner.

Robert B. Lindsey, whose appointment as assistant division engineer of the Louisville & Nashville, with headquarters at Louisville, Ky., was announced in the December issue, was born on June 21, 1914, at Alexandria, Va., and was graduated from the University of Tennessee in 1938. He entered the service of the Louisville & Nashville in 1940 as instrumentman, with headquarters at Knoxville, Tenn., and in 1942 was made draftsman in the chief engineer's office at Louisville. From 1943 until 1946 he served as assistant engineer at various locations and in the latter year was made resident engineer at Gautier, Miss., which position he held until his recent appointment as assistant division engineer.

Burton J. Worley, whose promotion to division engineer on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Aberdeen, S.D., was reported in the December issue, was born on November 15, 1917, at Aredale, Iowa, and attended Iowa State Teachers College and Iowa State College. Following his graduation from the latter school in 1939, with a degree of Bachelor of Science in Civil

Burton J. Worley

Engineering, he entered the service of the Milwaukee as a rodman at Chicago, and in 1941 was made instrumentman, with the same headquarters. In September, 1943, he was transferred to Butte, Mont., and later that year was appointed assistant engineer at that point. In April of this year he was made assistant division engineer at Butte, which position he held until his recent promotion to division engineer.

F. R. Paisley, assistant chief engineer of the Pittsburgh & Lake Erie, with headquarters at Pittsburgh, Pa., has been promoted to chief engineer, with the same headquarters, to succeed **N. W. McCallum,** who has retired after 48½ years of service with the New York Central System, of which the P. & L. E. is a part. **W. T. Elmes,** research engineer, has been promoted to assistant chief engineer, to succeed Mr. Paisley, and **H. G. Pike** has been

appointed research engineer to succeed Mr. Elmes.

H. D. Walker, special engineer of the Illinois Central, with headquarters at Chicago, has been promoted to principal

H. D. Walker

assistant engineer at that point, succeeding **Maro Johnson,** whose retirement was reported in the December issue. **E. R. Word,** supervisor of track at East St. Louis, Ill., has been advanced to assistant engineer at Chicago, and **C. J. Wallace** has been appointed engineer of design, also with headquarters at Chicago.

Mr. Walker was born on January 18, 1892, at Lakeland, Fla., and received a degree in engineering from the Virginia Military Institute in 1911. The following year he joined the I.C. as a chainman, and subsequently served as a rodman

Maro Johnson

and instrumentman before entering military service in 1917. He returned from army duty in 1919 and rejoined the I.C. to engage in construction work. In 1920, Mr. Walker became assistant engineer in the chief engineer's office at Chicago, remaining in that position until 1931, when he was appointed trainmaster at Carbondale, Ill. He later served as trainmaster successively at Paducah, Ky., and Louisville, and in 1944 became special engineer in the office of the vice-president and chief engineer, the position he held at the time of his new appointment.

Mr. Johnson was born at Iowa City, Iowa, on November 27, 1877, and received

the degree of Bachelor of Science in civil engineering from the University of Iowa. He entered railway service with the Illinois Central in 1898 as masonry inspector, and in 1905 he was made resident engineer on construction at Indianapolis, Ind. In 1907 he was appointed resident engineer on grade separation at Chicago, serving in that capacity until 1912 when he became assistant engineer of bridges. He was promoted to engineer of bridges and buildings in 1913, and from 1916 to 1920 he was engaged in designing and erecting the St. Charles Air Line bascule bridge over the Chicago river. In 1920 he was appointed assistant engineer on the staff of the chief engineer, handling special projects as assigned, and in 1932 he became principal assistant engineer, the position he held at the time of his retirement.

Track

K. O. Shepard has been appointed roadmaster on the Canadian Pacific, with headquarters at London, Ont., to succeed **W. H. Gibson,** transferred.

H. A. Connor, general supervisor of track of the Manitoba district of the Canadian National, has been promoted to roadmaster, with headquarters at Brandon, Man., to succeed **A. J. Marshall,** who has retired.

E. K. Pearson, roadmaster on Subdivision No. 2 of the Madison division of the Chicago & North Western, at Madison, Wis., has been transferred to Subdivision No. 1, with the same headquarters, to succeed **F. C. Hajek,** who has been assigned to other duties.

M. E. Walker, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Wellsville, Ohio, was reported in the December issue, was born on June 3, 1900, at Howard, Pa., and entered the service of the Pennsylvania in 1919. In 1925 he was made assistant track foreman and the following year was promoted to track foreman, holding this position until 1937 when he was appointed general track foreman of the Philadelphia division. In 1943 he was made assistant supervisor of track, with headquarters at Lancaster, Pa., which position he held until his recent appointment as supervisor of track.

R. M. Buchanan, assistant supervisor of track on the New York division of the Pennsylvania, has been promoted to supervisor of track on the Indianapolis division, with headquarters at Columbus, Ind., succeeding **L. S. Strohl,** who has been transferred to Norristown, Pa. **J. T. Hartnett,** supervisor of track at Norristown, has been transferred to Orrville, Ohio, succeeding **J. M. Collins,** whose death is reported elsewhere in these columns. **W. H. Lindsay,** assistant supervisor of track on the Chicago Terminal division, has been transferred to the New York division to succeed Mr. Buchanan. **G. J. H. Seibert,** assistant engineer water service, at Philadelphia, Pa., has been promoted to assistant supervisor of track, with headquarters at Northumberland, Pa., to succeed **R. L. McMurtrie,** who has been transferred to the Chicago Terminal division, succeeding Mr. Lindsay.

Bridge and Building

C. D. Wallace, bridge and building supervisor on the Missouri Pacific, with headquarters at Monroe, La., has resigned.

W. E. Meredith has been appointed assistant master carpenter on the Long Island, with headquarters at Jamaica, N.Y.

E. C. Cockerham has been appointed assistant supervisor of bridges and buildings on the Louisville & Nashville, with headquarters at Evansville, Ind., to succeed **M. P. Walden,** who has retired.

T. J. Atkinson, Jr., master carpenter on the Chicago Terminal division of the Pennsylvania, has been transfered to the Panhandle division, with headquarters at Steubenville, Ohio, to replace **D. A. Speaker,** retired. **J. F. Twomey,** master carpenter on the Wilkes-Barre division has been transferred to the Chicago Terminal division, succeeding Mr. Atkinson, and **R. A. Westergren,** assistant master carpenter on the Eastern division, has been promoted to master carpenter on the Wilkes-Barre division, to succeed Mr. Twomey. **H. S. Hildebrand,** acting assistant master carpenter on the Ft. Wayne division, has been appointed assistant master carpenter on the Eastern division, succeeding Mr. Westergren. **R. S. Terrell,** carpenter foreman on the Cincinnati division, has been appointed acting assistant master carpenter on the Ft. Wayne division at Ft. Wayne, Ind., to succeed Mr. Hildebrand.

John Ebbens, whose appointment as supervisor of bridges and buildings on the Chicago & Western Indiana, with headquarters at Chicago, was announced in the December issue, was born on March 13, 1913, at Harrison, S.D., and in 1928 entered railroad service as a clerk in the transportation department of the Chicago & Eastern Illinois at Chicago. In 1936 he went with the Chicago & Western Indiana as station clerk and was later made bridge and building clerk, serving in that capacity until 1945, when he was appointed general bridge and building foreman with headquarters at Chicago.

Special

Winfred E. Doty has been appointed timber treating engineer on the New York Central, with headquarters at Rome, N.Y., to succeed **W. T. McCart,** retired.

Obituary

J. M. Collins, supervisor of track on the Pennsylvania at Orrville, Ohio, was killed in an automobile accident near Orrville on November 27.

Charles H. Gaylord, division engineer of the Oklahoma division of the Chicago, Rock Island & Pacific, with headquarters at El Reno, Okla., died on November 26.

Charles F. Philbrook, tie and timber agent of the Boston & Maine, with headquarters at Boston, Mass., died on December 2 at the Winchester (Mass.) hospital after a short illness, at the age of 60.

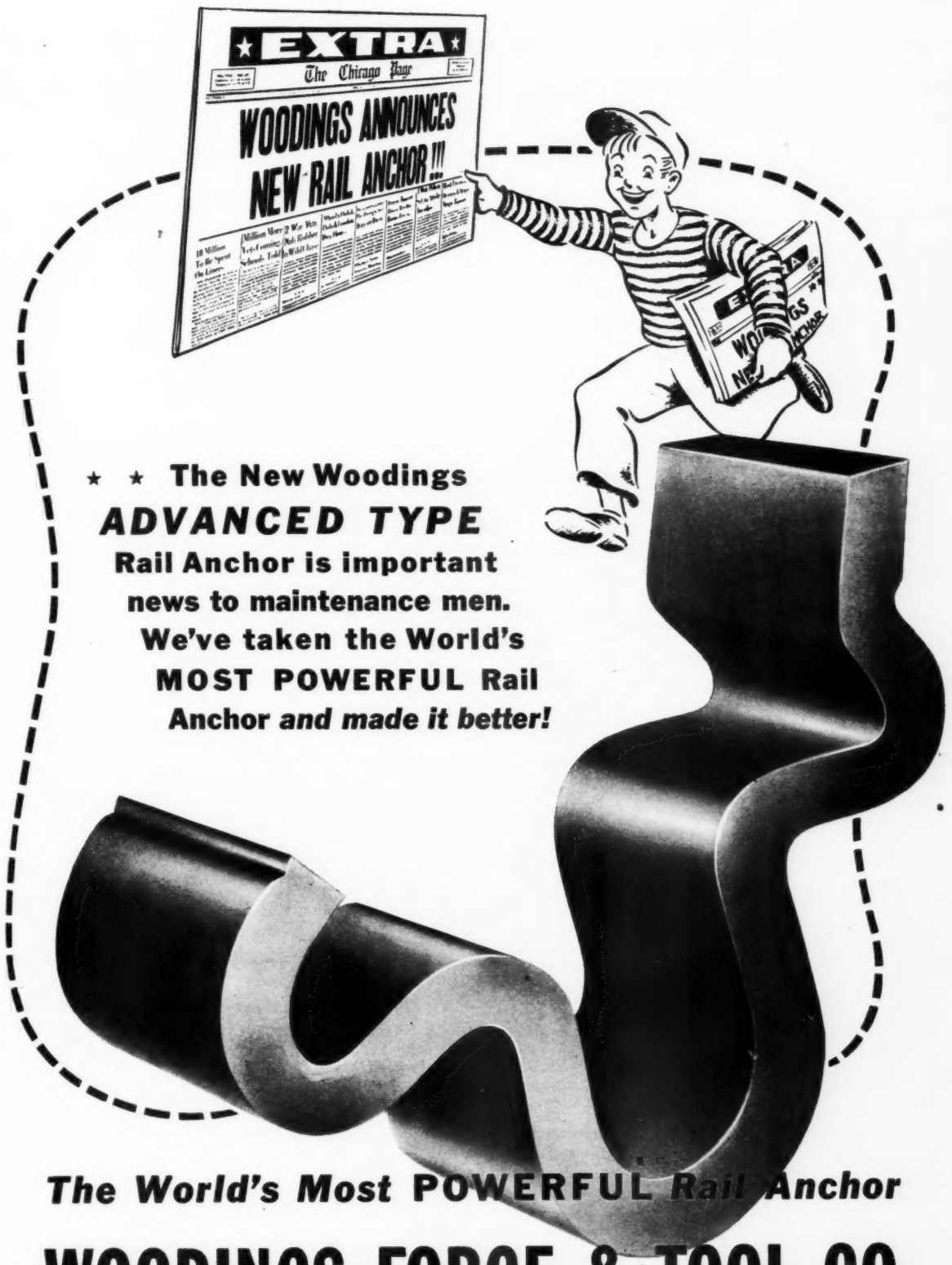
T. T. Irving, former chief engineer, Central Region, of the Canadian National, died at Orlando, Fla., on October 18. Mr. Irving was born at Vernon, P.E.I., and received his higher education at McGill university. Following his graduation in 1898 he entered railroad service as assistant to the resident engineer of the Grand Trunk Western at Montreal, Que. In 1902 he was promoted to resident engineer, and served successively as division engineer and chief engineer until 1924 when he was appointed chief engineer of the Central Region of the Canadian National.

Otto Joslin, senior assistant engineer of the Nashville, Chattanooga & St. Louis, with headquarters at Nashville, Tenn., died at his home in that city on November 24. Mr. Joslin was born in Dickson county, Tenn., on June 4, 1889, and received his higher education at Vanderbilt university. He entered the service of the N. C. & St. L. in 1910 as a rodman and a year later was made instrumentman, in which capacity he served at various locations until 1914 when he was promoted to assistant engineer. His subsequent career was as follows: Supervising engineer in charge of construction, 1920-31; track supervisor, 1931-37; and bridge and building supervisor, 1937-39. In 1939 he was appointed senior assistant engineer.

Arthur P. Button, assistant to chief engineer of the New York Central, with headquarters at Chicago, died suddenly of a heart attack at his home in that city on November 29. Mr. Button was born on August 21, 1888, at Schaghticoke, N.Y., and received his higher education at Rennselaer Polytechnic Institute. He entered railroad service in 1909 as a rodman on construction on the New York Central & Hudson River (now the New York Central) at Albany, N.Y., and Utica. In 1910 he was appointed draftsman on construction at Rome, N.Y., and subsequently served as draftsman on plans (barge canal crossings), 1915; engineer of barge canal crossings, 1916-17; assistant engineer of construction, 1918; assistant engineer (corporate), 1919-21; assistant engineer of grade crossing elimination, 1922-25; engineer of grade separation, 1926-38; engineer of grade crossings, 1939-43; and designing engineer, 1944-45. In 1945 he was appointed assistant to chief engineer.

Bardwell Named Among "Ten Ablest Chemists"—R. C. Bardwell, superintendent water supply, Chesapeake & Ohio, with headquarters at Richmond, Va., has been named among the ten ablest chemists and chemical engineers in the field of "water, sewerage, and sanitation", in a poll conducted by "The Chemical Bulletin", publication of the Chicago section of the American Chemical Society. The poll covered 20 specialized fields, of which only Mr. Bardwell's group was applicable to the railroad field.

(*Please turn to page* 78)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Association News

Wood Preservers' Association

Plans are practically complete for the annual convention of the association to be held in St. Paul, Minn., April 27-29. Members and guests will be housed at the Hotel St. Paul and nearby Hotel Lowry. Features of the program wil be presented in the February issue.

Bridge & Building Association

The personnel of all of the technical committees of the association has been completed and the various committees have undertaken their work, looking to the presentation of reports at the annual meeting, in Chicago, in September. The annual meeting, which will be concurrent with the annual meeting of the Roadmasters' Association, at the Hotel Stevens, will be held September 20-22—Monday through Wednesday—the Monday opening, rather than on Tuesday as in past years, being decided upon in the interest of insuring members more adequate hotel accommodations.

Roadmasters' Association

The Executive committee of the association met in Chicago on December 5 and completed the selection of personnel of all technical committees to make studies for reports to be presented at the next annual convention. By special board action, the dates of the next convention, to be held in Chicago, were advanced one day to September 20-22, in order to begin the meeting on Monday, instead of Tuesday, as in the past. The Monday opening was decided upon in the interest of assuring members more adequate hotel accommodations than would be possible under the former arrangement.

Maintenance of Way Club of Chicago

The next meeting of the club will be held on Monday, January 26, at Harding's at the Fair, beginning with dinner at 6:30 p.m. The feature of this meeting will be an address by L. L. Adams, assistant chief engineer, Louisville & Nashville, who will discuss the extensive damage to L. & N. tracks and structures along the Gulf Coast as a result of the recent hurricane and high water in that area. This discussion, which is to be accompanied by both motion pictures and lantern slides, will also describe the extensive rehabilitation measures necessary to restore service.

Track Supply Association; B. & B. Supply Men's Association

Several changes are contemplated in the exhibit program of these associations in September, occasioned by the plans of the Roadmasters' and B.&B. Associations to begin their annual conventions on Monday, September 20, instead of Tuesday, September 21, and to close on Wednesday instead of Thursday. These changes will be announced later.

Already, a considerable number of inquiries have been received concerning exhibit space, and further inquiries should be addressed to Lewis Thomas, director of exhibits, 59 E. Van Buren St., Chicago. However, exhibit contract forms will not be sent out until a later date.

Metropolitan Maintenance of Way Club

E. M. Hastings, chief engineer, Richmond, Fredericksburg & Potomac, and president of the American Society of Civil Engineers, was the speaker at the last meeting of the club, which was held on December 11 at the Hotel Sheraton, New York. This was a luncheon meeting in conjunction with the annual dinner of the New York Railroad Club, and was attended by 143 members and guests. Speaking on "An Engineer Looks at the State of the Nation", Mr. Hastings reviewed the many problems—national and international—that confront the country, and challenged his fellow engineering and maintenance officers to extend and broaden their sights to new horizons of understanding, helpfulness and achievement.

American Railway Engineering Association

Nominations for the annual election of officers of the association have been announced. In line with usual practice this election will be by letter ballot, with the ballots to be mailed to members about February 1. The nominations are as follows:

President, C. H. Mottier, vice-president and chief engineer, Illinois Central, Chicago; vice-president, G. L. Sitton, assistant chief engineer, Southern System, Washington, D. C.; directors (three to be elected), R. L. Groover, chief engineer, Atlantic Coast Line, Wilmington, N. C.; F. J. Bishop, chief engineer, Akron, Canton & Youngstown, Akron, Ohio; C. G. Grove, chief engineer maintenance of way, Pennsylvania, Chicago; R. J. Gammie, chief engineer, Texas & Pacific, Dallas, Texas; Clark Hungerford, president, St. Louis-San Francisco, St. Louis, Mo.; W. J. Hedley, assistant chief engineer, Wabash, St. Louis, Mo.; E. C. Vandenburgh, chief engineer, Chicago & North Western, Chicago; P. O. Ferris, chief engineer, Delaware & Hudson, Albany, N. Y.; and G. W. Miller, district engineer, Canadian Pacific, Toronto, Ont.

For members of the Nominating committee (five to be elected): E. J. Brown, engineer of track, Burlington Lines, Chicago; I. H. Schram, chief engineer, Erie, Cleveland, Ohio; C. J. Henry, assistant chief engineer, Pennsylvania, Philadelphia, Pa.; E. E. Mayo, chief engineer, Southern Pacific, San Francisco, Cal.; W. T. Alexander, assistant chief engineer, Texas & Pacific, Dallas, Texas; R. W. Marye, general manager, Charleston & Western Carolina, Augusta, Ga.; W. L. Young, principal assistant engineer, Norfolk & Western, Roanoke, Va.; E. S. Birkenwald, engineer bridges, Southern, Cincinnati, Ohio; M. H. Dick, managing editor, *Railway Engineering & Maintenance*, Chicago; and C. S. Burt, manager forest products, Illinois Central, Memphis, Tenn.

In addition to the above names to be balloted on, F. S. Schwinn, assistant chief engineer, Missouri Pacific Lines, Houston, Texas, will automatically be advanced from junior vice-president to senior vice-president.

No committee meetings were held during December, but two are scheduled to take place during January. The Committee on Economics of Railway Location and Operation will meet at Washington, D. C., on January 22, and the Committee on Masonry will hold a meeting in New York on January 28-29.

The December Bulletin (No. 470) was mailed to members late in the month. This Bulletin contains reports of the Committees on Wood Preservation, Economics of Railway Labor, Maintenance of Way Work Equipment, Waterproofing, Ties, and Iron and Steel Structures.

Meetings and Conventions

American Railway Bridge and Building Association—Annual meeting, September 20-22, 1948, Hotel Stevens, Chicago. Elise LaChance, secretary, 431 S. Dearborn street, Chicago 5.

American Railway Engineering Association—Annual Meeting, March 16-18, 1948, Chicago. W. S. Lacher, secretary, 59 E. Van Buren street, Chicago 5.

American Wood-Preservers' Association—Annual meeting, April 27-29, 1948, St. Paul, Minn. H. L. Dawson, secretary-treasurer, 1429 Eye street, N.W., Washington 5, D. C.

Bridge and Building Supply Men's Association—Joint exhibit with Track Supply Association, September 20-22, 1948, Hotel Stevens, Chicago, during concurrent conventions of American Railway Bridge and Building Association and Roadmasters' Association. E. C. Gunther, secretary, 122 S. Michigan avenue, Chicago 3.

Maintenance of Way Club of Chicago—Next meeting, January 26, 1948. C. R. Knowles, secretary-treasurer, 105 W. Adams street, Chicago 3.

National Railway Appliances Association—Thirty-third annual exhibit, Chicago, March 15-18, 1948, in connection with A.R.E.A. convention. C. H. White, secretary, 208 S. LaSalle street, Chicago 4.

Roadmasters' and Maintenance of Way Association of America—Annual meeting, September 20-22, 1948, Hotel Stevens, Chicago. Elise LaChance, secretary, 431 S. Dearborn street, Chicago 5.

Track Supply Association—Joint exhibit with Bridge and Building Supply Men's Association, September 20-22, 1948, Hotel Stevens, Chicago, during concurrent conventions of Roadmasters' Association and American Railway Bridge and Building Association. Lewis Thomas, secretary, 59 E. Van Buren street, Chicago 5.

Supply Trade News

General

The Morrison Railway Supply Corporation has announced the removal of its offices to 814 Rand Building, Buffalo, N.Y.

The Air Reduction Company has announced the formation of a new wholly-owned subsidiary, the **Air Reduction Pacific Company.** The new subsidiary has been formed in recognition of the increasing importance and continuing growth of west coast industry. It will carry on all the business formerly conducted by Air Reduction Sales Company in the western region of the United States, including the present San Francisco, Los Angeles, Portland and Seattle sales dis-

(*Continued on page* 80)

SCHRAMM

No. 60 CRAWLER AIR COMPRESSOR

EASY MOBILITY MULTIPLIES ITS USES

The Schramm No. 60 Crawler is an efficient compressor for serving four tie tampers, but that is not all. Because it goes anywhere—on or off the track under its own power—it is right for many other railroad jobs as well, even ones in the most inaccessible places. Its crawler treads, driven by a powerful motor, give it maximum maneuverability and convenience.

Get full details about this new air producer which makes such a hit with all who see it. Bulletin FC-48 is waiting for you. Get your copy from the Railway Sales Department, Schramm, Inc., "The Compressor People," West Chester, Pennsylvania.

Tie tamping

Trench digging

Concrete breaking

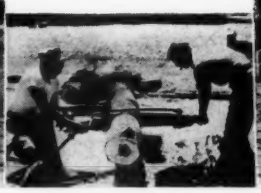
Sand blasting

Weed burning

Rock drilling

Spray Painting

Crawler with tool rack



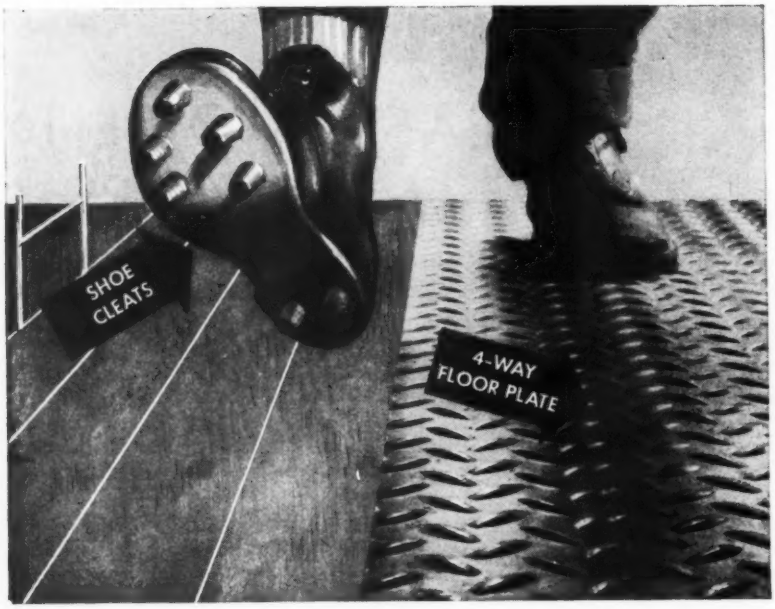
Sawing

Backfill tamping

Plus these Extra Bonus Uses!

Question: What to do with a compressor when you don't need it for air tools? The answer is easy if you have a Schramm No. 60 Crawler. To the left you see it (with proper attachments) performing three non-compressor jobs—backfilling, weed mowing, and supplying power for sump pumps, saws, etc. It is the compressor with *plus* utility.

Two Ways to Prevent Slipping



Your employees won't need football shoes for sure footing if your plant is equipped with Inland 4-Way Floor Plate.

Farsighted management relies on this modern skid-resistant flooring to protect workers from dangerous accidents caused by the number one industrial hazard . . . slipping. It knows, through experience, how Inland 4-Way Floor Plate increases profits by reducing lost man-hours and costly damage suits.

Inland 4-Way Floor Plate provides built-in safety wherever feet or equipment must go . . . floors, walkways, ramps, platforms, steps. Its sure-grip traction results from Inland's plant-proven 4-way safety lug pattern.

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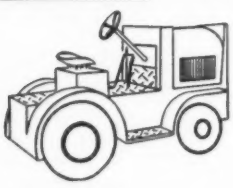

INLAND STEEL

Use...

INLAND 4-WAY FLOOR PLATE

(*Continued from page* 78)

tricts. These districts, which embrace all or parts of eight western states, will retain their identity within the new company. **H. P. Etter,** formerly sales manager of the Pacific Coast division, will be president and director of Air Reduction Pacific Company, and will make his headquarters at 220 Bush Street, San Francisco, Cal.

Personal

John L. Beard has been appointed manager of the Small Products division of the **American Hoist & Derrick Co.,** with headquarters at St. Paul, Minn. Mr. Beard, who joined the company in 1945, will

John L. Beard

direct sales and merchandising for his division through American Hoist's worldwide sales organization.

W. L. Nies, sales engineer of **Fairbanks, Morse & Co.,** with headquarters at Chicago, has resigned his connection with that company.

H. A. Pratt, superintendent of the plant of the **Davey Compressor Company** at Kent, Ohio, has been appointed parts and service manager of this company, with the same headquarters.

W. H. Scherer, assistant to the vice-president in charge of manufacturing of the **Worthington Pump & Machinery Corp.,** has been appointed general manager of the **Ransome Machinery Company,** a Worthington subsidiary, at Dunellen, N.J. Mr. Scherer, who has served as acting manager of Ransome, has also been elected a director of that company.

The Blackmer Pump Company has announced the appointment of **George A. Baldwin** as manager of its Los Angeles (Cal.) sales office. Following his graduation from the University of Illinois with a B.A. degree in advertising, Mr. Baldwin served as advertising manager of the Insulox division of Owens-Illinois Glass Company, and was later associated with the William W. Garrison advertising agency.

Kenneth F. Ames, a member of the **Caterpillar Tractor Company's** general sales department, and **Russell S. Cornell**

(*Continued on page* 82)

"WHY CAN'T WE HAVE TRACK LIKE THAT?"

It was the Chief Engineer of a large system addressing the local Maintenance Engineer. He had just returned from an inspection of a small line that crossed the system track, his company having taken over the smaller line.

"I JUST RODE THE FINEST PIECE OF TRACK THAT I HAVE EVER INSPECTED. WHY CAN'T WE HAVE TRACK LIKE THAT?"

"YOU WANT THE ANSWER TO THAT, CHIEF? That line has had the READE COMPANY apply chemical weed killer for the past five years. I have asked you time and time again for their chemical and service but you throw the wet blanket on it. It can be done but not without the know how that the READE COMPANY provides."

This was a conversation that actually took place less than sixty days ago. Engineers no longer regard weed killer as a luxury. In these days of high labor cost, nothing contributes so much towards a well maintained track as a weed free roadbed. And the use of chemical of the proper type is the answer to a weed free roadbed.

We pioneered in this work—back in 1883, Wm. J. Reade brought chemical weed killer from the British Colonies where its use was found to be the answer to this problem of weed control.

LET US REVIEW YOUR WEED CONTROL PROBLEM WITH YOU. WE CAN RENDER COMPLETE SERVICE INCLUDING THE ACTUAL SPRAYING OF THE CHEMICAL OR WE CAN PROVIDE THE TYPE OF EQUIPMENT THAT YOU NEED TO DO THIS WORK YOURSELF.

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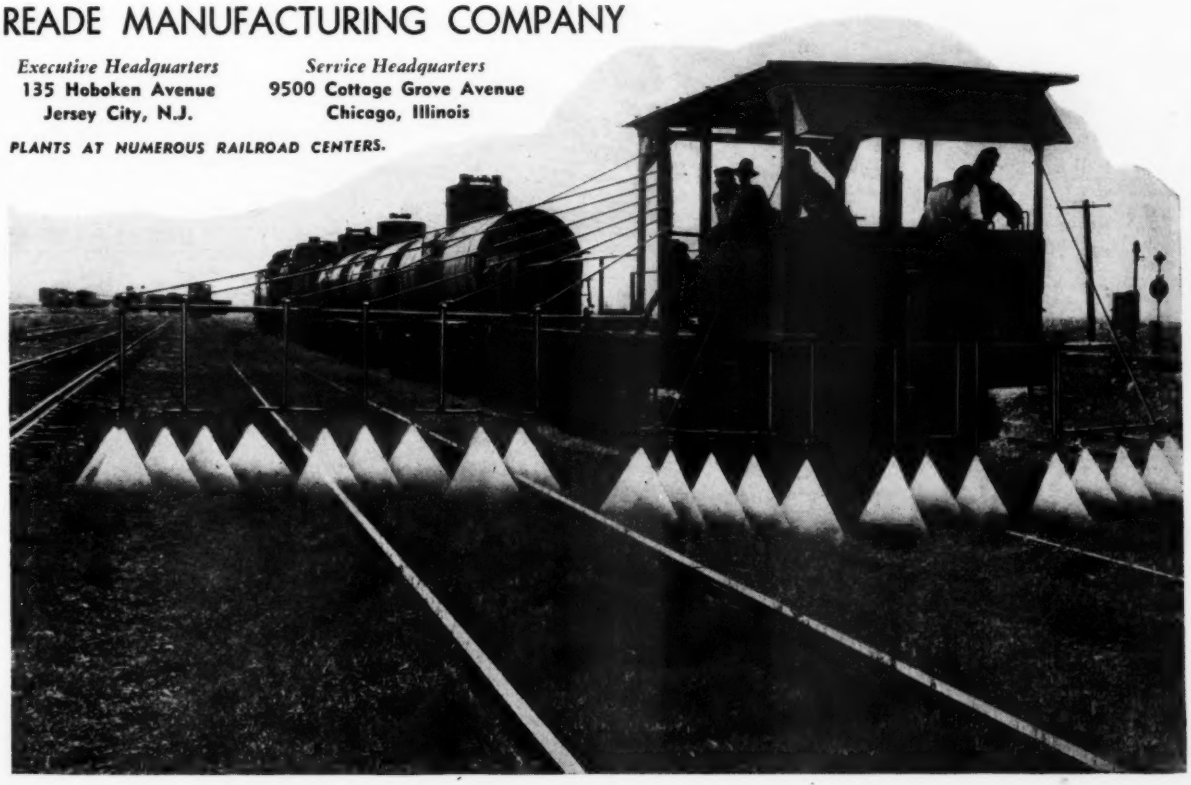
PLANTS AT NUMEROUS RAILROAD CENTERS.



FOR TIGHT CORNERS
and
TOUGH SPOTS

Because Burro Cranes are designed and built to meet the specific needs of railroads, they are as efficient and practical on all maintenance-of-way, re-location or track laying as on the countless other odd jobs they do. Short tail swing of the Burro will not foul adjoining track and work can go on regardless of traffic. When Burro is working on single track, fast travel speeds and/or power set-off mechanism will get Burro off the track or to a side track in a hurry.

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- Short tail swing—will not foul adjoining track.
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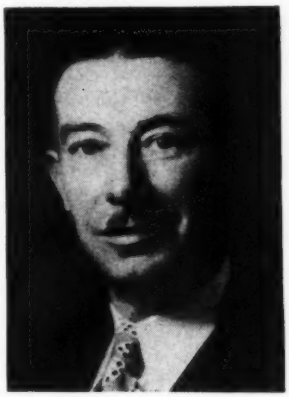
(*Continued from page* 80)

and **Truman E. Sage,** district sales representatives, have been appointed assistant sales manager respectively of the firm's Central, Eastern and Western sales divisions. The headquarters of Mr. Ames and Mr. Cornell will be located at the Peoria (Ill.) plant, and that of Mr. Sage at the San Leandro (Cal.) plant.

W. J. Acker has been appointed eastern sales manager of the **Rail Joint Company,** with headquarters as before at New York. Mr. Acker entered the service of the Rail



W. J. Acker

Joint Company as a draftsman in 1923 and was appointed assistant to the manager of the insulated joint department in 1930. He was assigned to the sales department as a representative in 1944 and served in that capacity until his recent promotion.

C. W. Pendock, president of the **Le Roi Company,** at Milwaukee, Wis., resigned from that position recently and was subsequently elected chairman of the firm's board of directors. Succeeding Mr. Pendock as president is **E. A. Longenecker,** former president of the Lauson Division of the Hart-Carter Company.

The **Gar Wood Industries, Inc.,** with headquarters at Wayne, Mich., has announced a number of personnel changes. **E. B. Hill** has been appointed general sales manager, and **R. F. Whitworth** becomes general service manager. Four domestic regional sales offices have been created under Mr. Hill, with the following managers: **Ross Miller,** San Francisco, Cal. (Western region); **A. C. Berg,** Wayne (Central region); **W. G. Barrett,** Boston, Mass. (Northeast region); and **H. C. Hatch,** Washington, D. C. (Southeast region). **J. D. Towne** and **W. S. Blakeslee** have been appointed division manager and sales manager respectively of the Wayne division.

Obituary

Emil W. K. Roe, president of the Aldon Company, died at his home in Wilmette, Ill., on December 15, at the age of 73. Mr. Roe spent his entire business life in the railway field, and after serving with

(*Continued on page* 84)

The MONOTUBE Method

gives bridges a good start in life

EXPERIENCED engineers, architects and builders who plan long-lived projects specify Monotube tapered steel piles—time after time.

That's because Monotubes have proved on all kinds of foundation work—for bridges, buildings, highways, piers—that they reduce costs . . . save time.

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NO CHIPPING
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Resurface with STONHARD!

There's no need to rip up your old floor . . . apply STONHARD RESURFACER at a thickness of 1/2 inch right over the old surface.

Use STONHARD to resurface or patch your wood, concrete or composition floors, ramps and passenger or freight platforms . . . provides a tough, resilient surface that gives years of service.

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Send us information about STONHARD RESURFACER and a free floor maintenance guide.

Firm .....

Mr. ..... Title .....

Address .....

City ..... Zone ..... State .....

(*Continued from page* 82)

various consulting engineering firms was appointed secretary of the Handy Car Equipment Company. In 1904 he organized the Aldon Company and headed this corporation as president until his death.

Harold G. Warr, vice-president in charge of engineering of the P. & M.

Harold G. Warr

Company, with headquarters at Chicago, died in that city on December 10 while en route to a hospital following a heart attack. Mr. Warr was born in Chicago in March, 1883, and studied engineering at Lewis Institute. He joined the P. & M. Company in 1913, and was advanced to company engineer in 1918. He was promoted to assistant general manager in 1921 and to chief engineer in 1930. Mr. Warr, who had been vice-president in charge of engineering of the firm since 1943, was also the inventor of a number of railway track appliances.

Charles H. White, director of sales in the South and West regions for the In-

Charles H. White

dustrial Brownhoist Corporation, with headquarters at Chicago, died suddenly on December 24 at Cleveland, Ohio. Mr. White was born at Mansfield, Ohio, on March 17, 1888, and joined the Brown Hoisting Machinery Company (now Industrial Brownhoist Corporation) in 1907, serving in the time, cost and traffic departments until March 25, 1917, when he was transferred to the sales department. From 1921 until 1927 he was southern manager at New Orleans, La. In April, 1927, he was appointed district sales manager, with headquarters at Chicago, and since August, 1946, he had been director of sales of the South and West regions, with the same headquarters. Mr. White was a member of the National Railway Appliances Association, serving as president in 1936, and as secretary and director of exhibits since 1935.

Trade Publications

(To obtain copies of any of the publications mentioned in this column, use postcards, page 35)

Fairbanks, Morse Motor Cars—Fairbanks, Morse & Co., has published three four-page folders, each of which describes one model in the current line of Fairbanks, Morse track motor cars. Two heavy section motor cars—No. 40-B and No. 44-B—are described as its Model 55-D—a light section motor car. Effectively printed in two colors, each folder describes the salient features of the model and gives a complete list of specifications.

Electric Chain Saw—The Homelite Corporation has published a four-page folder in two colors, describing the Homelite one-man electric chain saw. The folder describes, in pictoral form, the various applications of this saw in limbing, felling and bucking trees up to 3 ft. in diameter, and also shows its use in bridge and building construction. Also described is the Homelite "carryable" generator by which the saw is operated, which can be used to operate other standard 110-volt electric tools or for floodlighting.

Fight Water—The Sika Chemical Corporation has recently published a four-page folder entitled "Fight Water," which describes the use of this company's material for waterproofing and sealing concrete and masonry. Specifications and sketches are given for waterproofing concrete and mortar surfaces and joints in new construction, while highlights are presented on maintenance and repair problems, such as sealing leaks against pressure and repairing structures that are below grade.

Michigan Cranes and Shovels—Several pieces of literature have been issued by the Michigan Power Shovel Company, which are devoted to the various cranes and shovels manufactured by this company. Bulletin 24 is a 16-page illustrated publication that covers in a comprehensive manner, by text and photographs, the mechanical features and applications of the company's Model T-6-K six-ton, 1/8-yd. mobile crane-shovel. Bulletin 544, also containing 16 pages, describes the company's Model TMDT-16 unit (10 tons, 1/2 yd.), and the Model TLDT-20 machine (12 tons, 1/2 yd.). The publications issued also include a series of four-page illustraded data sheets as follows: Bulletin 105-C, covering the Model C-16 power shovel; Bulletin 105-TK, covering the Model T-6-K mobile shovel-crane; Bulletin 105-LD devoted to the Model TLDT-20 mobile unit; and Bulletin 105-MD which deals with the Model TMDT-16 mobile shovel.

FRISCO ROUTES MATERIAL

VIA

LORAIN FOR FAST HANDLING

LORAINS are a familiar sight along the right-of-way of the Frisco lines. Unit No. 4 is this new 2 yd. Lorain-820 shovel. And it's maintaining a fast schedule of dirt delivery—requiring only 40 minutes to load out an 8 car work train.

More and more railroads are utilizing the complete line of Lorain shovels and cranes to speed up all phases of their work program. Available in a range of capacities from ½ yd. up, there's a size and type Lorain to fit every need. For the big, heavy-duty jobs, take your choice of the 1¼ and 2 yd. units making up the "Lorain 820 Series". In the ½ and ¾ yd. classes you have a selection of crawler or rubber-tire mountings. All Lorains are converted readily to shovel, crane, clamshell, dragline or hoe operation.

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These washers are strong and tough, yet provide the necessary "springing action" required at rail joints, frogs and crossings.

We control every step of their manufacture—from the specification of the specially-developed formula and process used in making the steel to the forming, hardening, tempering and testing operations.

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MADE ESPECIALLY FOR RAILROAD SERVICE

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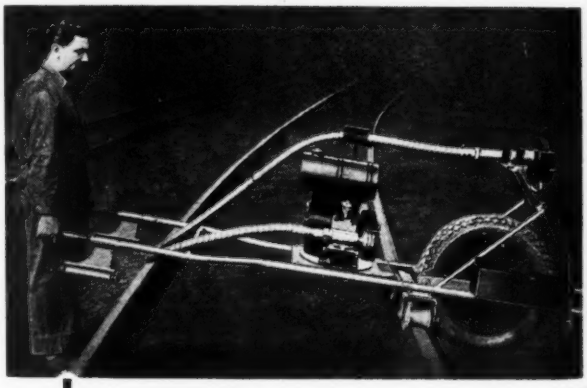

Featuring durability plus easy handling, the new P-40 Grinder is designed for on- or off-track operation, for free-hand grinding of rail ends, crossings and frogs, flange ways, switch points and stock rails. Unit consists of 6 hp air-cooled engine (or electric motor) with V-Belt driven, ball-bearing mounted, counter shaft coupled to flexible shaft. Moving parts are well protected from dirt and dust.

★ Engine mounted on ball-bearing swivel plate facilitates handling of flexible shaft and attachments. Locking device prevents swiveling in transit.

★ Transverse operating position speeds handling of unit on and off track.

★ Transporting wheel adjusts to 3 positions . . . for moving over switches, cross-overs, etc. . . . for levelling machine for off-track work . . . for removal or replacing on track.

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★ Sturdy safety guards protect operators from belts and grinding wheels.

★ P-40 also operates RTW auxiliary attachments: straight-wheel hand piece, cup-wheel angle hand piece, cross grinding guide and track drill.

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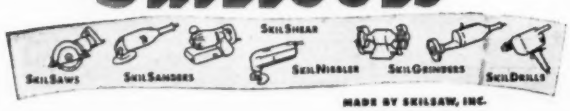

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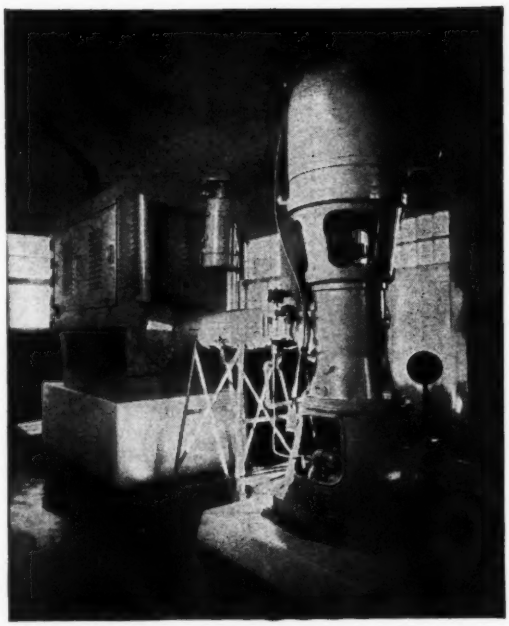

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For additional information, use postcard, pages 35-36

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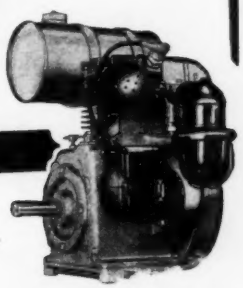
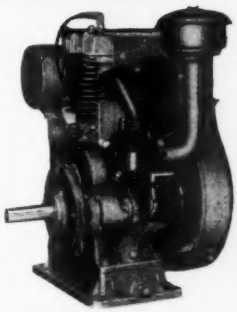
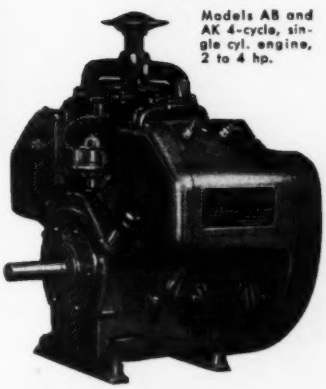


Models AB and AK 4-cycle, single cyl. engine, 2 to 4 hp.



Models AEH, AFH, AGH, AHH 4-cycle, single cyl. standard engine, 3 to 9 hp.



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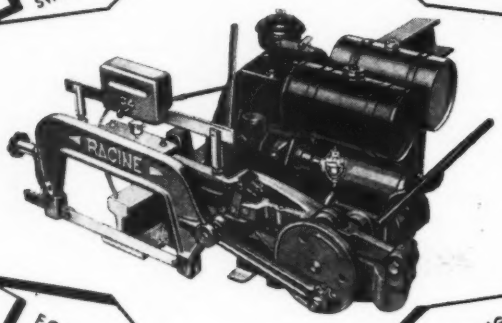

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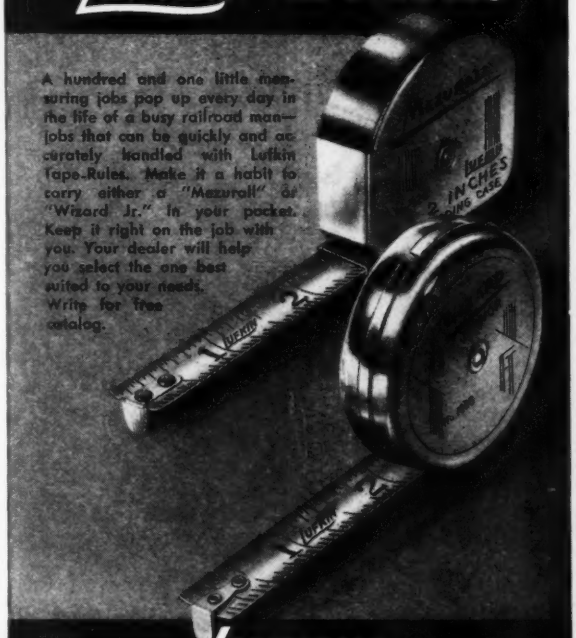

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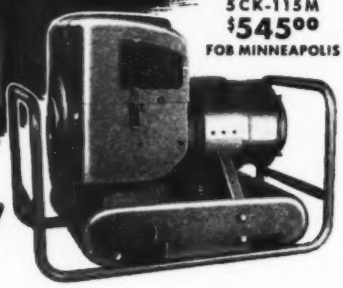

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The proved accuracy of these methods has caused them to be accepted as standard practice on many roads. Complex algebraic and geometric calculations are reduced to their simplest form and as nearly as possible to terms of simple arithmetic. Application of these calculations to the actual job is made plain by brief explanations. Drawings clarify and make the meaning of the text unmistakable. Tables of dimensions and graphs still further meet the practical needs of track foremen.

CONTENTS

Curves: The Relining of Curves with a String—Preliminary Study of the Curve—The Solution of String Lining Problems—Superelevation of Curves—The Spiral—The Vertical Curve—Economics of Curves—Practical Switch Connections: Essential Elements in the Design of Switch Connections—Rules for Computing Switch Dimensions—Rules for Various Functions of Turnouts—Practical Considerations in Installing Turnouts—Methods in Installing and Maintaining Switches—Siding Location: Simplified Field Work—Special Practices.

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Classified Advertising Department
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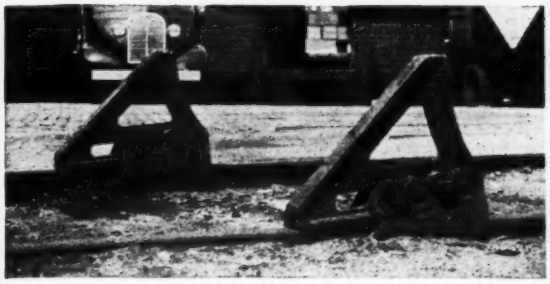
Q and C Car Stops
CONSERVE TRACK SPACE



Q&C Car Stops are economical because they require very little track space and a minimum of labor for application. They wedge firmly to the rails—no drilling is necessary. One size is suitable for all sections of rail used in yards and side tracks.

Specify them on your requisitions.

THE Q AND C COMPANY

Chicago 5, New York 6, St. Louis 1

Simplex No. 550 Rail Puller and Expander; 25-tons capacity, 4½" to 8" expansion, 4½" to 8" pull, weight 87 lbs.
The proper tool to correct improper railjoints!
Without interrupting service, one man with a Rail Puller and Expander easily and quickly spaces joints, and prevents damage to rail ends, bolts and crossings. Also saves man-hours when lining crossings and switches, renewing insulated joints and end posts, and pushing or pulling continuous rail lengths.
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LEVER · SCREW · HYDRAULIC
Jacks
Templeton, Kenly & Co., Chicago (44), Ill.
Better, Safer Jacks Since 1899

OILED AIR* FOR PNEUMATIC TOOLS

New ARNOLD LUBRICATOR

Light Weight
Easily Portable

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Arnold gives you all of these features:

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LIGHT WEIGHT — made from new aluminum alloy, most popular size weighs only 14 ounces.

STRONG—this rugged lubricator can take it, actually stronger than cast iron.

FOUR MODELS—Sizes from 1/6 pt. to 1 pt. capacity. Pipe size to one inch.

FREE—CATALOGUE SHEET
Order from your dealer
If he cannot supply you, write direct, sending us your dealer's name.

The RUCKER Company
4228 Hollis Street Oakland 8, Calif.
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The "US" line is complete — Gasoline and Diesel units from ½ to 140 kw. AC or DC. Compact Portable units . . . dependable Stand-by units . . . and rugged units for Continuous Duty.

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438 NEBRASKA STREET OSHKOSH, WIS.

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- *It's Self-Propelled*
- *It Rides on Rubber*
- *It Has 1001 Uses!*

5 TON CAPACITY— 7 TON WITH OUTRIGGERS

UNIT 357 Clamshell unloading sand.

Fast, versatile industrial crane with plenty of LIFT ability . . . ideal for moving castings, steel, scrap, coal, lumber or even machine tools. Travels anywhere . . . on paved surfaces, cinders or just plain mud . . . gets there in a hurry. Available with crane hook, clamshell, or magnet . . . quickly convertible to any other attachment. *Operated by ONE man* . . . powered by ONE engine . . . controlled from ONE position in cab.

**Features include: *Hydraulic steering . . . Air-actuated hydraulic brakes . . . One-piece cast gear case completely encloses and oil-seals all working parts. FULL VISION CAB,* pioneered by UNIT, provides 360° visibility for greater safety and efficiency.

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UNIT 357 Crane lifting bar stock.

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FOR PRICE AND DELIVERY *or See Your Dealer*

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ler snow, slush, storm, sand and sun,—
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and west,—IMPROVED HIPOWERS
o maintain track, equalizing bolt
ions and holding all bolts tight.

IMPROVED HIPOWERS
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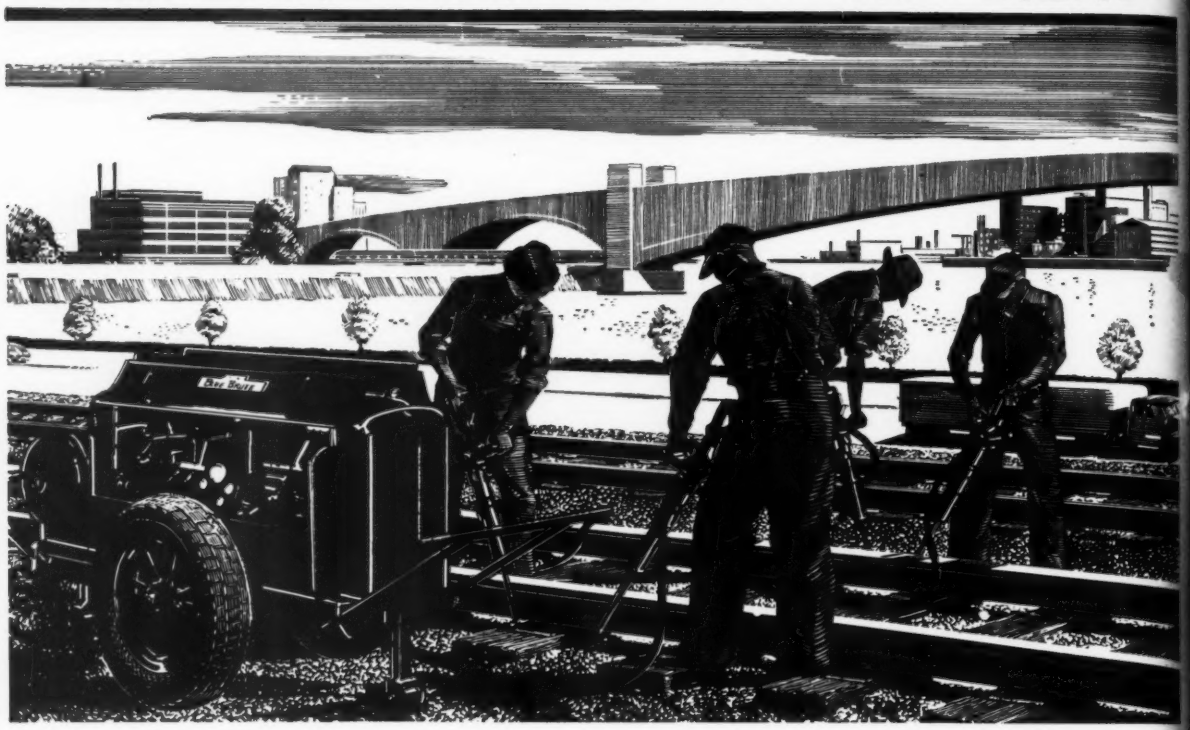
NATIONAL LOCK WASHER COMPANY, NEWARK, 5, N. J., U. S. A.
A COMPLETE LINE OF RAILWAY SPRING WASHERS

BLUE BRUTE TRACK TEAMS RACE AHEAD



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H7-6

WORTHINGTON

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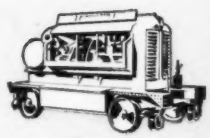
BUY BLUE BRUTES

Pneumatic Grouter

Portable Concrete Mixer

Self Priming Centrifugal Pump

Hand Held Air Tools



Railcar Compressor

FOR EVERY CONSTRUCTION AND MAINTENANCE JOB